SCIENTIFIC AMERICAN

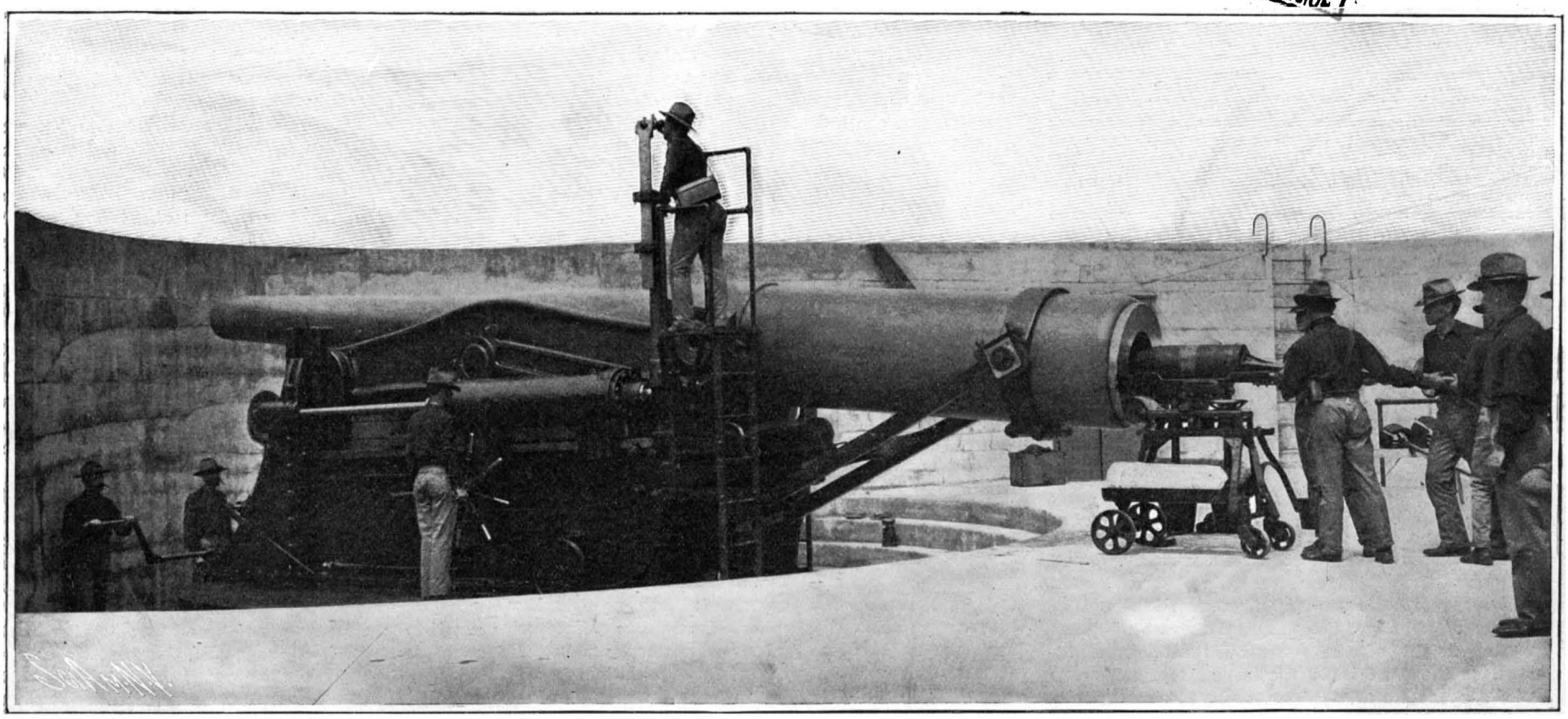
[Entered at the Post Office of New York, N. Y., as Second Class Matter. Copyright, 1905, by Munn & Co.]

Vol. XCII.—No. 16.
ESTABLISHED 1845.

NEW YORK, APRIL 22, 1905.

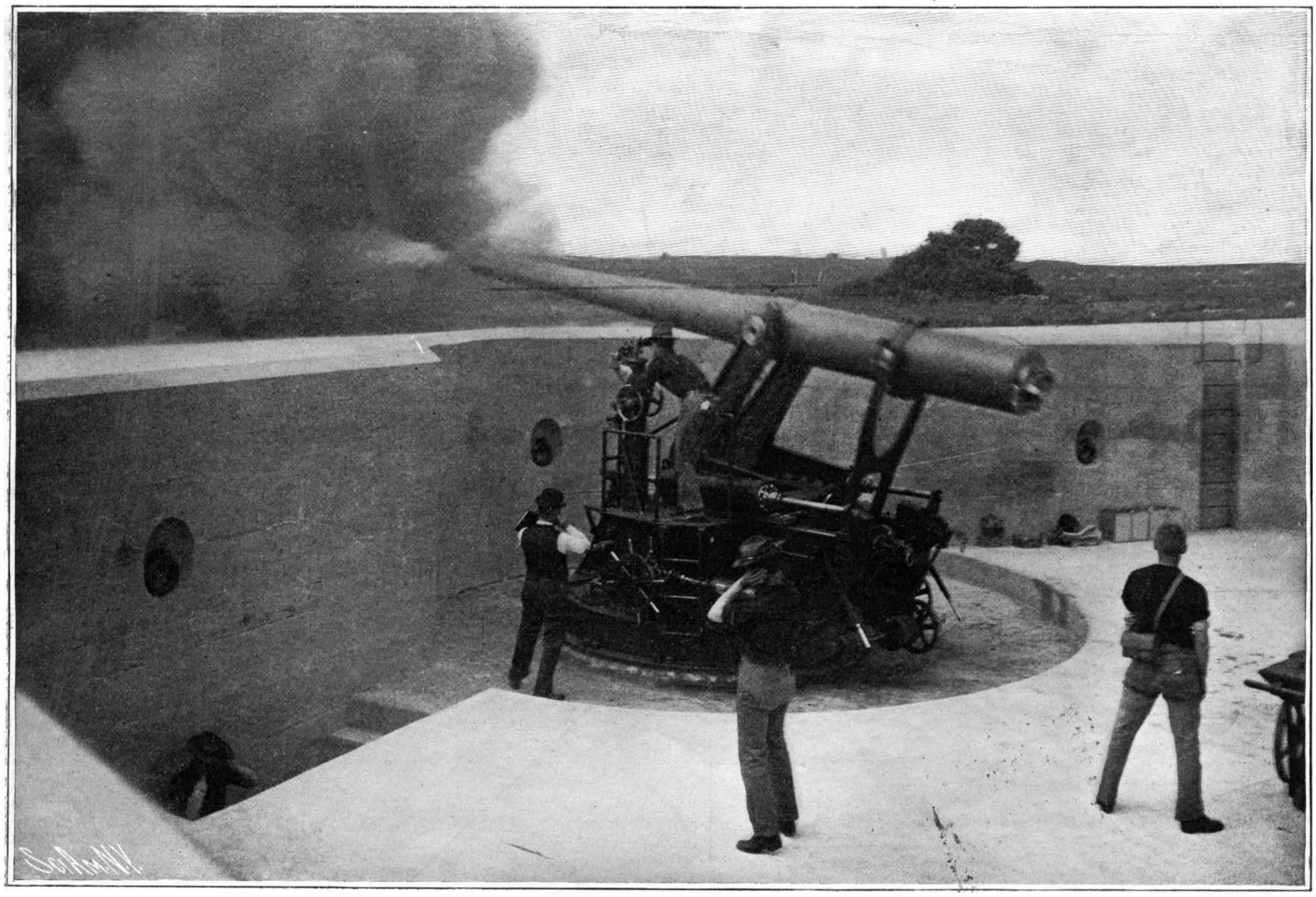
[8 CENTS A COPY
$3.00 A YEAR.

WAR DEPARTMENT
OFFICE CHIEF OF STAFF
No.
APR 21 1905
MILITARY
INFORMATION DIVISION



View inside the fortification, showing complete concealment of the piece and the gun detachment during loading.

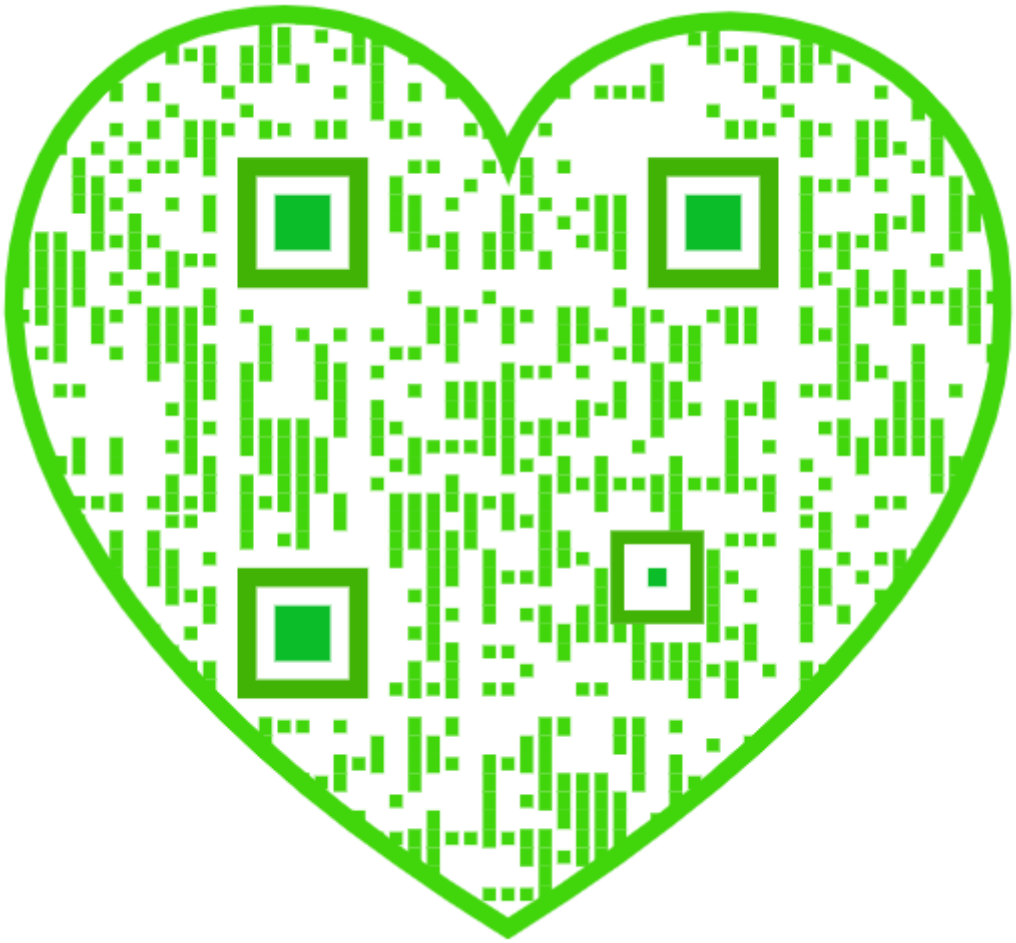
Disappearing 10-Inch Breech-Loading Gun in the Loading Position.



The gun is swinging back and down to the loading position.

Discharge of a 6-Inch Disappearing Gun.

THE DISAPPEARING COAST-DEFENSE GUN.—[See page 320.]



SCIENTIFIC AMERICAN

ESTABLISHED 1845

MUNN & CO., - - Editors and Proprietors

Published Weekly at

No. 361 Broadway, New York

TERMS TO SUBSCRIBERS

One copy, one year for the United States, Canada, or Mexico $3.00
One copy, one year, to any foreign country, postage prepaid. £0 16s. 5d. 4.00

THE SCIENTIFIC AMERICAN PUBLICATIONS.

Scientific American (Established 1845) ..... $3.00 a year
Scientific American Supplement (Established 1876) ..... 5.00 "
Scientific American Building Monthly (Established 1885) ..... 2.50 "
Scientific American Export Edition (Established 1878) ..... 3.00 "

The combined subscription rates and rates to foreign countries will be furnished upon application.
Remit by postal or express money order, or by bank draft or check.
MUNN & CO., 361 Broadway, New York.

NEW YORK, SATURDAY, APRIL 22, 1905.

The Editor is always glad to receive for examination illustrated articles on subjects of timely interest. If the photographs are *sharp*, the articles *short*, and the facts *authentic*, the contributions will receive special attention. Accepted articles will be paid for at regular space rates.

MAXIMUM LOAD DUE TO CROWDING.

It certainly does seem rather late in the day to discover that the assumed maximum load on bridges, platforms, and floors, due to a crowd of people, is much greater than our engineers have been accustomed to suppose. In designing any bridge or framed structure that will be subjected to varying degrees of loading, it is customary to assume a certain maximum amount which can never be exceeded, and then so proportion the structure that when this maximum loading occurs, no part will be strained beyond a certain predetermined amount, usually stated as so many pounds to the square inch of section. Evidently the ability of a structure to stand well up to its work, supposing that all the subsequent calculations of the design are correct, will depend upon the accuracy of this assumed maximum loading. In the case of a bridge, the principal sources of stress are the weight of the structure itself, commonly known as the dead load; the weight of the moving loads, such as trains, vehicles, and pedestrians, commonly known as the live load; the loads due to wind pressure; and, lastly, the irregular changes of form in the structure resulting from variations of temperature. A few weeks ago we commented editorially on the fact that the wind stresses that have hitherto been assumed for frame structures were too large, particularly in the case of bridges of great length, and roofs or buildings presenting very large areas to the wind. That was one of the rare instances in which engineers have erred on the side of caution. It now seems that in the case of platforms, and floor surfaces which are liable to be very heavily crowded, the assumed unit of loading has been altogether too small; and in proof of this, we direct attention to the experiments of Mr. L. J. Johnson, professor of engineering at Harvard University, which are described in another column of the present issue. It is shown very clearly, in these experiments, that in the case of floors, platforms, and bridges, that are liable to be heavily congested with a crowd of people, the assumed loading of say from 50 to 100 pounds per square foot is really much smaller than the loading that may actually occur. It is probably the suspicion of this fact that has caused the bridge department of this city to close such structures as the Brooklyn Bridge and the Williamsburg Bridge to foot passenger traffic, whenever there was any public event, pageant, or what-not, in their vicinity which would lead to their being densely crowded.

The danger, however, does not lie in these important structures, so much as in the numberless stairways, foot-bridges, and platforms that lead to the great centers of traffic in our larger cities, of which the most notable instances, perhaps, are to be found in connection with the approaches to the terminals of the Brooklyn Bridge on both sides of the river. Mr. Johnson has found that the weight per square foot due to a crowd of people may be as high as 181.3 pounds, and that it may easily and frequently reach the figure of 160 pounds. Now there is a foot-bridge leading from the Fulton Street and Brighton Beach Railway terminals to the main terminal of the Brooklyn Bridge, which is some 18 or 20 feet in width and nearly 150 feet in length, that is liable, at times, to be crowded quite as densely as was the platform on which Mr. Johnson determined the load to be equal to over 180 pounds to the square foot. It is an interesting question, which we commend to the engineer who designed that structure, as to how far his assumed loading agrees with the maximum loading as determined in these experiments at Harvard University. There are doubtless many other similar foot-bridges, stairways, etc, in various parts of the country of which the question might be asked with equal pertinence.

ROJESTVENSKY.

Never, surely, in the history of naval warfare did the fortunes of his country depend so absolutely upon a single man as do those of the Russian empire upon Rojestvensky and the fleet which he has taken into the China Sea. Strategically considered, the present stage of the Japanese war is critical and dramatic to the highest degree. Both by sea and by land the Russian forces have been subjected to an unbroken series of disastrous defeats. Save for a pitiful remnant of three badly-battered ships at Vladivostock, the once powerful Pacific fleet of Russia has ceased to exist. Her great armies, gathered from all corners of her empire, commanded by her picked generals, lavishly equipped with the best implements of modern warfare, have suffered three overwhelming defeats, and the shattered remnant is being driven back steadily before the resistless wave of Japanese invasion.

And now, at the eleventh hour, when the whole world, friends and foes alike, is telling Russia that the game is lost, she launches into the very heart of the conflict her last despairing forlorn hope, in the person of Admiral Rojestvensky with his travel-worn fleet of something less than half a hundred ships. At the present writing this fleet is steaming directly along the frequented trade routes, with no effort at concealment, and with an evident determination to seek out the thrice-victorious Togo and try conclusions in a desperate fight to a finish.

Whatever may have been said about the Baltic fleet—the haste with which it was gathered, its oft-delayed start, its terrible blunder among the fishing fleet in the North Sea—the whole world must join in giving the Russian admiral his full meed of praise for steaming straight for his powerful enemy at the close of his 17,000-mile voyage which is no small accomplishment in itself. The task before him is truly appalling. With half a hemisphere between him and a home port; with a veteran and tried fleet of the enemy guarding the only avenues of approach to the one remaining Russian port far to the north; with that port blockaded and its entrances heavily mined; with no friendly harbor nigh at hand to which he can retire to recover from the stress of a hard-earned victory, or shelter after a disastrous defeat; it must be admitted, in all fairness, that what Rojestvensky has done and is aiming to do, has been well done, and is being attempted in a manner truly heroic.

It would be a rash prophecy to declare that in the impending battle victory must necessarily fall to the Japanese fleet. Matters are not as they were when the determination was first taken to dispatch a second fleet to the Pacific. Since that time at least one, and probably two, of the Japanese battleships have been lost beyond recovery, and it is quite possible that Togo can oppose but four battleships to the seven battleships under Rojestvensky—and it is battleships that decide, and ever will decide, the fate of a naval campaign.

There can be no question that the Baltic fleet has been greatly underestimated by the general public, partly because of the North Sea incident, and partly because of the widely-circulated rumor that this was a "scratch fleet," composed of obsolete vessels. As to this last, nothing could be farther from the truth. Four of the battleships are absolutely new. They are an improvement upon the "Czarevitch," which, it will be remembered, stood for hours the concentrated attack of Togo's battleships, without having any of her big guns silenced or the structural efficiency of her hull seriously impaired. These four ships are probably able to stand a severer hammering, and are more difficult to sink by gun fire than any ships afloat in the world to-day. The "Borodino," "Orel," "Alexander III.," and "Suvaroff" mount, among them, sixteen 12-inch, 40-caliber guns, which, being absolutely new, are good for a muzzle velocity of 2,600 feet per second. The Russians use capped projectiles, and with these the gun is capable of penetrating 12 inches of Krupp steel at 5,000 yards and 15 inches at 3,000 yards. If Admiral Togo is to sink these ships, or so cripple them as to have them at his mercy, he will have to fight at a range so near that the Russian ships cannot fail to place their shells with considerable effect upon his vessels. In addition to these battleships there is the "Osliabia," built in 1900, which carries four 10-inch guns, capable of penetrating 10½ inches of steel at 5,000 yards and 13 inches at 3,000 yards. All of these vessels have a trial speed of 18 knots an hour, although, of course, they are just now much slower because of foul bottoms. The other two battleships, "Sissoi Veliky" and "Navarin," mount between them eight 12-inch, 35-caliber guns, capable of penetrating 8½ inches of Krupp steel at 5,000 and 11 inches at 3,000 yards. Their speed is two knots slower than that of the other battleships. The four Japanese battleships (or five, as the case may be) mount between them either sixteen or twenty 12-inch guns of about the same penetrative power as the Russian pieces. With the exception of the "Mikasa," however, they are protected by Harveyized armor, of considerably less resistance than the Krupp steel on the latest Russian ships. In battleships the Russians have undoubtedly a preponderance of power.

It is to be borne in mind, however, that Japan possesses eight or seven (one is reported to have been lost) very effective armored cruisers, any one of which is more than a match for the two old armored cruisers "Nakhimoff" and "Donskoi" of the Russian fleet. They mount, between them, thirty-two guns of 8-inch caliber, and they are protected by 6 to 7 inches of Krupp armor. It is scarcely likely, however, that these ships will be placed in the first line of battle, within range of the 12-inch guns of the Russian fleet; and with the possible exception of the Italian-built "Kasuga" and "Nisshin," they will probably be held in reserve until it is seen how the fight between the battleships is going. Should Togo be able to draw the sting from the Russian battleships, and seriously cripple them, his armored cruisers would close in to assist in delivering the *coup de grace*.

The Russian fleet includes several fine protected cruisers of between 3,000 and 6,000 tons displacement, and a few torpedo boats. If Rojestvensky should by any chance elude Admiral Togo and effect a junction with the armored cruisers at Vladivostock, his fleet would be greatly strengthened, and his chances of success enhanced; but that is a remote possibility.

So much for the *materiel* of the fleet; and it must be admitted that, judged on this basis, the second Pacific squadron is a menace to Japan's command of the sea, so serious as to make it possible that a victorious peace may be snatched from her grasp in the very moment of its attainment. But when we come to consider the other elements of efficiency, such as the condition of the ships, the familiarity of officers and crews with their vessels, the skill of the gunners, and the general *morale* of the whole fleet, it must be admitted that the advantages lie very greatly with Japan. The Japanese are familiar with the sound and the shock of battle. The Russians, who doubtless have been doing much target practice during their six months' cruise, are accustomed merely to the discharge of their own guns—they know nothing of the awful crash of bursting shell; the rending of steel plating; the sight of shattered limbs and all the hideous carnage of a 'tween decks that is being swept by the enemy's fire. It is one thing to aim at a floating target during the quiet routine of a cruise, and another to aim at a target that is making the deck upon which one stands a veritable shambles. Rojestvensky leads his fleet to what the world, perhaps unjustly, considers to be at best but a forlorn hope; whereas the Japanese steam into battle flushed with all the confidence and self-possession born of an unbroken succession of victories. Rarely did two contending fleets fight with such stupendous consequences hanging upon the result. Should Japan win, she will reap the fruits of a series of victories that is without parallel in the history of the world, and move at a bound to the front rank as a world power. Should Rojestvensky, by crushing the enemy, obtain command of the seas, and cut off Oyama and his armies from Japan, he will have wrested victory from defeat, and saved to Russia an empire that has all but fallen from her grasp.

RADIUM ON METALS.

M. Bronislas Sabat recently made a series of experiments in M. Curie's laboratory as to the action of radium rays on the electric resistance of different metals. The rays were obtained with the strongest preparation of radium in the laboratory, namely, a bulb containing 0.2 gramme of pure radium bromide. Thin wires of the different metals were rolled around paper tubes in order to form a resistance coil, and the radium bulb was placed in the center of the tube. The rays of the radium thus act upon the wire. As an example, an iron wire which started with a resistance of 4.64 ohms, at once rose to 4.66 under the first action of the rays, and after five minutes' action rose to 4.68, which is the maximum effect. After removing the radium, the wire comes back to the original resistance in a few minutes. For iron, this gives a difference of 0.776 per cent. In the case of a platinum wire of the same diameter (0.1 millimeter) he finds 0.257 per cent. For German silver, it is but 0.092 per cent. Bismuth shows 0.284 per cent. The variations depend upon the size of the wire and the absorbing power for the rays, etc. A certain increase of resistance is thus found at once, and before the heat is communicated from the radium. The greatest variation of the resistance sometimes goes beyond the point which would be reached by the heat sent from the radium alone, and it is probable that the metals absorb the rays (principally the β-rays) and these are transformed to heat, raising the temperature of the metals and then changing their electric resistance. This action is analogous to the absorption of the cathodic rays by metals. The β-rays give a smaller heat effect, however, as they are absorbed by the metals in a less degree than the cathode rays.

OUR HERITAGE OF THE MECHANICAL ARTS.

BY ALEX. DEL MAR, M.E.

The most important event in the history of the mechanical arts, the discovery of iron, is without a certain date. Iron is mentioned in the Vedas, the Upanishads, the Bible, and the Iliad; it appears in the fragments of Sanchoniathon; it is delineated upon the Egyptian monuments assigned to Thothmes III.; nevertheless, the date of its discovery is a problem which is not yet satisfactorily solved. The secret of smelting iron ores and converting them into metal was certainly discovered by somebody, somewhere, and at some remote time; but we know not where, when, nor by whom. When this discovery did occur, at all events when it became publicly known and commonly put into practice, it must have exercised as profound an influence upon the ancient world, as that of gunpowder and firearms has had upon the modern. Iron not only armed the people who discovered it with superior offensive weapons; it enabled them to build ramparts of stone, to pierce the rocks for silver, copper, and lead, and to fabricate nearly all those implements, tools, and devices which distinguish the mechanical arts. The name *chalybo*, for iron, points to Chalybia, and of *damas*, for steel, to Damas, or as we write it, Damascus. In the vicinity of both of these districts, very ancient iron mines have been discovered; and in the former district, at Ayazinn, Mr. Ramsay found rock sepulchers, guarded by gigantic carved lions, and a large chapel, all carved out of the solid rock, which could only have been executed with steel tools. Col. Leake found at Nacolaeia, in the Sangarius valley, a royal tomb, in the form of a temple, carved in the solid rock, with a Phrygian inscription by Attes, dedicated to Midas; while, near by, were the remains of a city, which, from its great extent, is supposed to have been the capital of the Sangarians, or Maryandians.

In the age assigned to the Judges of Israel, about the twelfth century B. C., Jabin, the King of Canaan, or Phœnicia, who dwelt at Hazor, about sixty miles southwest of Damascus, is said to have possessed nine hundred chariots of iron. (Judges iv, 3.) "Can one break iron from the North?" (Jer. xv, 12) and "I will break the bar of Damascus" (Amos i, 5) are passages which were probably written several centuries before our era, and may refer to a still more remote period; while they evidently point to the vicinity of Damascus as a well-known iron center.

Could we accept these indications for a certain guide, the advent of iron, at least so far as the western world is concerned, might be fixed at about the twelfth century before our era. Both iron and steel were certainly very scarce in the West at the periods mentioned. Homer, tenth century, mentions poleaxes, shipwrights' tools, plowshares, sheep-hooks, and chariot-wheels in the Troad; yet in Lacedæmonia, in the time of Lycurgus, ninth century, iron was still so valuable that he employed it as a material for money. The theory has been advanced that the Chalybes, Veneti, and Dorians were the same people, who, after being driven out of Asia, invaded Greece, and with their iron weapons destroyed that splendid bronze civilization which is revealed in the magnificent remains of Tiryns and Mycenæ—a theory that the pedimented hexastyle temple, carved in the Sargon relief at Monasier, goes somewhat to substantiate. Twenty-six centuries later, Cortes performed a similar exploit in Mexico. There is admittedly a gap of three centuries both in the literature and archæology of Greece, a gap that extends from the assumed date of the Dorian invasion, 1104 B. C., to the Lycurgan age. Whatever may have been the history of iron and steel during this interval, these metals only came into géneral use during the Solonic era, when, by their agency in opening the silver mines of Laurium, they threw upon the world those treasures which extended and quickened commerce, established the mechanical arts, and offered such rewards to discovery and invention, as will ever render that age memorable. A bare list of the illustrious men who adorned it is sufficient to suggest the most notable discoveries known to man.

The mechanical inventions which came more or less into general use during the Solonic age embrace the iron or steel hammer, saw, adz, auger, shovel, pick, chisel, gimlet, square, flint-and-steel, lock, key, and lathe; for although these and many more inventions were assigned by Pliny and others to mythological personages of a remoter age, no remains have been found of these tools, or of their products, of a period earlier than about the eighth century; this being also the age of similar implements found by Layard at Nineveh. The Vedas frequently mention iron or steel weapons, armor and tools, including the razor; but Romesh Chunder Dutt, the native historian of India, assures us that no stone statues, or other works made by iron or steel tools, have been found in India of an age much before the Buddhic era. Mr. Grote, the historian of Greece, comes to much the same conclusion with regard to that country; there are no works which involved the use of iron or steel, or even of bronze implements, much before the Solonic age. Schliemann's discoveries point to somewhat the same result. Most of the utensils, axes, hammers, knives, and saws found at Hissarlik (Troy) were of stone, but few of bronze, and none of iron. At Mycenæ, the arrows were flint-headed; the shields were made of wood, with leather attachments; while the swords, knives, tools, and utensils were of bronze. Even these were of the Iron age. The final determination of the inquiry is that while perhaps the fabrication of iron was known to the Brahmins so early as the fifteenth century, it was kept secret in the temples until the period assigned to the Mahabharata war, when it escaped to Chalybia, and there gave rise to that notable industry whose marks still excite the curiosity of the archæologist.

From Chalybia the iron industry was extended or removed to the vicinity of Damascus, whence, by the agency of Phœnician commerce, it was carried to Argos in Greece and Tarshish in Spain. (Ezek. xxvii, 12.) As the voyages of the Phœnicians to Cassiterides, for tin, could hardly have been made, except in ships whose planks were fastened together with iron spikes, or rivets, or with copper ones; and as copper, except in very small quantities, could not have been obtained without the use of iron tools to cut the inclosing rocks, it follows that, owing to the scarcity of iron down to the Lycurgan age, the earlier commerce in tin, if made to Britain, was conducted, like the amber trade, overland. Baron von Humboldt has, however, pointed out that *cashthira* is merely the Sanskrit word for tin; so that the stream-tin, which the earlier Phœnicians got from "Cassiterides," the Land of Tin, may have come from Malacca in India, or Galicia in Spain; and that the Phœnicians did not trade by sea to Britain until a later age. As for the theory that there was a Bronze age before there was an Iron one, and that during such period copper tools were hardened by an application of tin, so as to cut quartz or porphyry, the burden of proof still rests upon its advocates. Thus far, archæology does not support them.

Among the elements of material progress which marked the Solonic age was the Public Library which Aulus Gellius (vi, 18) informs us was established at Athens by Pisistratus. At subsequent periods, Ptolemy Philadelphus at Alexandria, and Eumenes II. at Pergamus, formed extensive collections of books and parchments, but solely for their own benefit, and not for that of the public. After Pisistratus, the next public library was that of Asinius Pollio in Rome.

(To be continued.)

NOVELTIES IN FIRE ALARMS.

Two different types of automatic fire alarms have been devised by Scotch and Danish inventors respectively. The former contrivance, in addition to raising the alarm, becomes an automatic sprinkler of considerable power as well, and thus becomes a valuable first-aid appliance, while the action of the latter is solely confined to the ringing of the alarm bell.

Some severe tests of a practical nature were recently carried out with the former device upon some extensive sawmills containing a large number of valuable woodworking machines in Aberdeen (Scotland). In this expansion system there is neither water nor compressed air in the sprinkler pipes, so that in the event of a sprinkler head becoming accidentally damaged, no flooding of the premises or other injury results. In the first test a mass of shavings and other combustibles were piled in a heap and saturated with oil and then ignited. Within ten seconds the sprinklers were pouring a volume of water upon the flames from three sprinkler heads, and the fire was rapidly extinguished.

In the second test the loading court of the mills, 65 feet in length by 25 feet wide and 3 feet high on either side, was selected. A pile of shavings similarly treated were fired here, and fanned by the severe draft blowing through the passage, was soon an immense sheet of flame. The sprinklers, however, acted, and in a few minutes the fire was completely extinguished.

For the third test, however, the machine room itself was selected to display the confidence of the inventors in their device. The mass of shavings was piled upon the floor among the seventy machines in the shop and fired. Within thirty seconds the detector acted, and streams of water poured upon the burning mass from three sprinklers, and the fire was quickly quelled—long before the arrival of the local fire brigade from the station one and one-quarter miles away, which was called by the detector. The success of this latter experiment conclusively demonstrated that the apparatus, if not successful in extinguishing a fire, is at any rate of sufficient power and value to localize it and prevent its spreading by soddening all the surroundings. The advantage of the system lies in the fact that it not only automatically calles the brigade, but renders valuable service during the initial stages of the conflagration.

In the Danish invention the alarm, which is of a very sensitive description, is only brought into action by a sudden wave of heat. The appliance consists of a U-shaped tube four inches in height filled with mercury, the upper parts containing sulphuric ether and both ends being closed. One side of the tube is covered with non-conducting material. An even and gradual rise in the temperature simply warms the whole apparatus, but directly a wave of heat such as is caused by a fire comes into contact with it, the ether under the exposed glass is vaporized, forces down the mercury, closes a local electric circuit, and thereby rings the alarm bell.

SCIENCE NOTES.

Course of Solidification of the Moon.—M. Loewy, director of the Paris Observatory, and M. Puiseux, in a communication to the Académie des Sciences, hold that the solidification of the moon extends from the surface to the center, and not, as the English scientists think, from the center to the periphery. This view would modify various existing theories. Their conclusion is drawn from the examination of photographs executed at the observatory for reproduction in the new Lunar Atlas.

The Saharan Sea of the Cretaceous Period.—M. De Lapparent announces in a communication to the Académie des Sciences that he has received fossils lately discovered by two French officers, Capt. Théveniaud and Lieut. Desplagnes, a little to the north of Timbuctoo. A calcareous block containing fossils of the Cretaceous has also been found 350 kilometers from Timbuctoo. Therefore the sea which bathed the region of Bilma on the east extended more than 300 kilometers to the north of Timbuctoo.

A gramophone which, it is said, can be heard at a distance of three miles is the latest invention of the Hon. C. A. Parsons, of turbine fame. The instrument is named the auxetophone, and is worked by means of compressed air. This is pumped in by a small engine at a pressure which can be adjusted up to over 8 pounds, through a small valve, which takes the place of the ordinary diaphragm, into the trumpet. The valve consists of a number of small slots, covered with a fine comb, not unlike a mouth organ, and the vibration of this comb produces the sound. On a calm, windless day, it is estimated that, with a high pressure, the record could be distinctly heard three miles away.

Constitution of Meteorites.—The meteorite of the Cañon Diablo has been examined by MM. Moissan and Osmond, who have demonstrated that in the parts which appear homogeneous nuclei are met with formed of superposed layers of ferric phosphide and carbide. Also, the study of the nodules has shown that these are formed of troilite; that is, ferric sulphide, surrounded with successive layers of phosphide and carbide. The composition of this meteorite is therefore quite complex and the micrographic examination justifies the conclusion that the metallic mass has been submitted to violent pressure. In some of the nodules the troilite has been, as it were, laminated and has taken on a schistose structure.

Prof. Flinders Petrie, the eminent Egyptologist, has made some important discoveries in the Sinai peninsula. The ancient temple of Seabit el Khadem, five days' camel journey south of Suez, he found to be of a Semitic type, different from any other known Egyptian temple, possessing two courts for ablution, and a long series of subterranean chambers, added by successive kings from the eighteenth to the twentieth dynasties. Many previously unknown hieroglyphic inscriptions relating to mining expeditions in Egypt were also brought to light by Prof. Petrie, who also found a very fine sculptured portrait of Queen Thy. The latter discovery is particularly interesting in the light of the recent opening of the queen's tomb at Luxor on the Nile.

Sir William Ramsay gave an account, at the Royal Society, of the quantities of neon and helium, gases discovered by him, which is interesting as showing the extremely small amounts with which modern physical chemistry can deal. First, argon, it will be remembered, was found by Lord Rayleigh and himself to lurk in atmospheric air; then helium, a substance which had been detected by the spectroscope in the sun, was identified in the earth's atmosphere. Next, three other gases were revealed—krypton, xenon, and neon—hiding themselves also in very minute quantities. Some time ago Sir William Ramsay communicated to the Society estimates of the amounts of krypton and of xenon in atmospheric air, and since then he has been doing the same for neon and helium. After a series of delicate investigations, which he described, he arrived at the conclusion that there are in gaseous air 86 parts by weight of neon in a thousand million, and 123 parts in the same by volume, while of helium there are 56 parts by weight in ten thousand million and 400 by volume in the same. Such minute amounts seem almost incalculably small, but corroborative tests had been applied, which indicated that the estimates could not be far from accurate.

MAXIMUM LOAD DUE TO A CROWD OF PEOPLE.

The accompanying illustration does not represent the descent of a crowd of people down the shaft of a mine, nor an overloaded elevator. It is a photograph of a careful attempt to determine exactly how great a load of people may be crowded within any given space—a subject of the most vital importance which ought to have been investigated in this careful manner long ago. The experiments were carried out at Harvard University by Mr. L. J. Johnson, professor of engineering, who recently published the results at a meeting of the American Society of Civil Engineers.

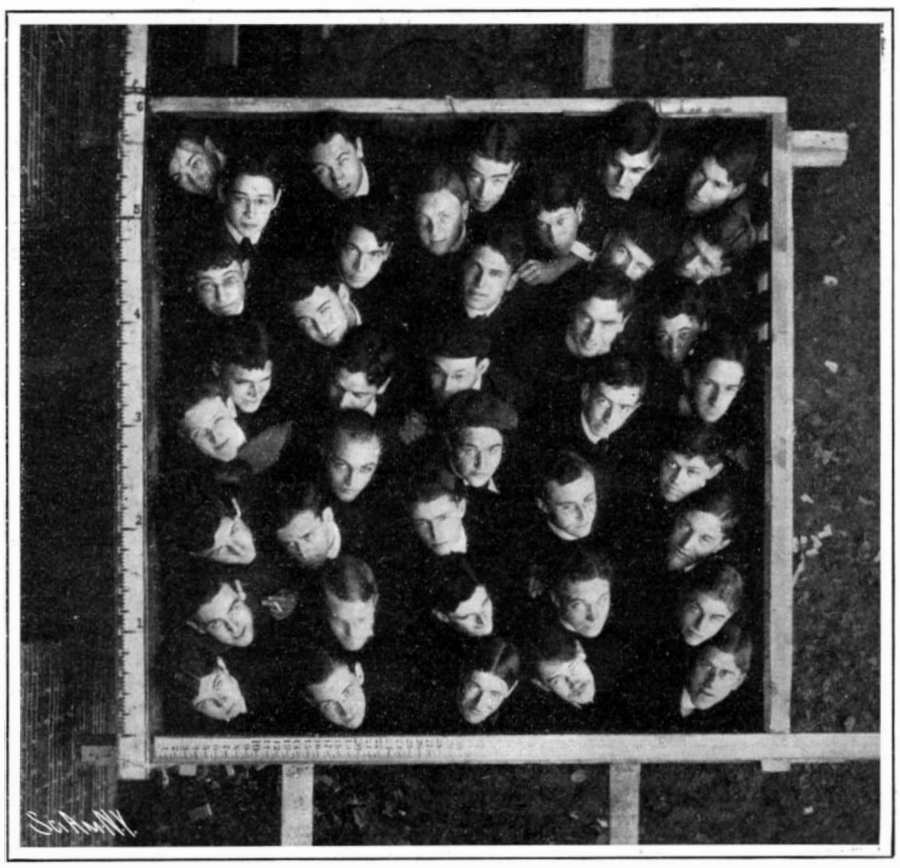
In obtaining this data, a box 6 feet square, provided with a gate at one side, was built, and a certain number of men, whose separate weights had been carefully taken, was placed within it. By dividing the aggregate weight of the men by the number of square feet within the box, the load per square foot was determined. In the first case eleven men were placed inside the box whose average weight was 154.6 pounds. This gave a load per square foot of 47.2 pounds, which is 2.2 pounds more than the loading that has been assumed in the designing of some floors, platforms, and bridges. That this loading does not represent the weight of an average crowd is proved by the fact that, when the men were lined up side by side around the walls of the box, they only covered three sides of it. Twenty-eight men of an average weight of 167.7 pounds were found to be equivalent to a load of 130.4 pounds per square foot.

In the early experiments, when the men were allowed to stand facing in various directions, a maximum result of 156 pounds per square foot was obtained; but since, in crossing a bridge, or in a packed assembly hall, all the people face one way, the experiments were continued in order to determine how much a crowd of this kind would weigh, and a result of 176.4 pounds per square foot was obtained. On studying the photograph it was evident that the maximum had not been reached, and ultimately forty men, averaging 163.2 pounds, were placed in the box, with the result that a maximum load of 181.3 pounds per square foot was obtained. The men, all of them undergraduate students of engineering, ranged in weight from 119.6 to 203.1 pounds, twelve of them weighing less than 150 and ten more than 175 pounds.

A competent and careful observer of the test which resulted in a load of 176.4 pounds per square foot, declared that, in his opinion, the congestion did not differ much from that of the crowd on the local drawbridge after football games; and this statement was borne out by the testimony of the men themselves.

In the discussion before the American Society of Civil Engineers, Mr. Theodore Cooper had given 45 pounds per square foot as the weight of the most densely packed crowds on the New York elevated trains. Those of us in New York who have experienced the crowding on these trains during rush hours will agree that the loading on the platforms and the cars must be nearer the 181.3 figure than the 45 pounds of Mr. Cooper's estimate.

We entirely agree with Mr. Johnson in his conviction that crowds of 167 pounds per square foot are entirely likely, and that from 130 to 140 pounds must be commonly reached in all places where people congregate standing.



These 40 men, averaging 163.2 pounds in weight, gave an average loading of 181.3 pounds per square foot.

MAXIMUM POSSIBLE LOAD ON BRIDGES AND PLATFORMS.

DISAPPEARING COAST-DEFENSE GUNS.

One of the lessons that the present war has served to emphasize very strongly, is the necessity for giving the greatest protection possible to the gun detachments. On land the question of the efficiency of artillery fire has resolved itself very largely into the question of invisibility. Such is the accuracy of the modern gun, so reliable are the means for finding the range, that when once a battery has been located, unless the cover is particularly complete, the silencing of the guns follows almost as a matter of course; and in the majority of cases it is the gunners, rather than the guns, that have been destroyed.

This question of invisibility is particularly important in the construction of fortifications and the emplacement of their guns. When the important scheme of defense drawn up by the Endicott board was determined upon, it was decided to make extensive use of the Buffington-Crozier system of disappearing guns, which is called after its inventors. The idea had received considerable attention in Europe previous to its adoption here, and was not, therefore, by any means in the nature of an experiment. The design which was then adopted, and has since been followed with only minor modifications, is probably the most satisfactory type of disappearing gun carriage in use at the present time.

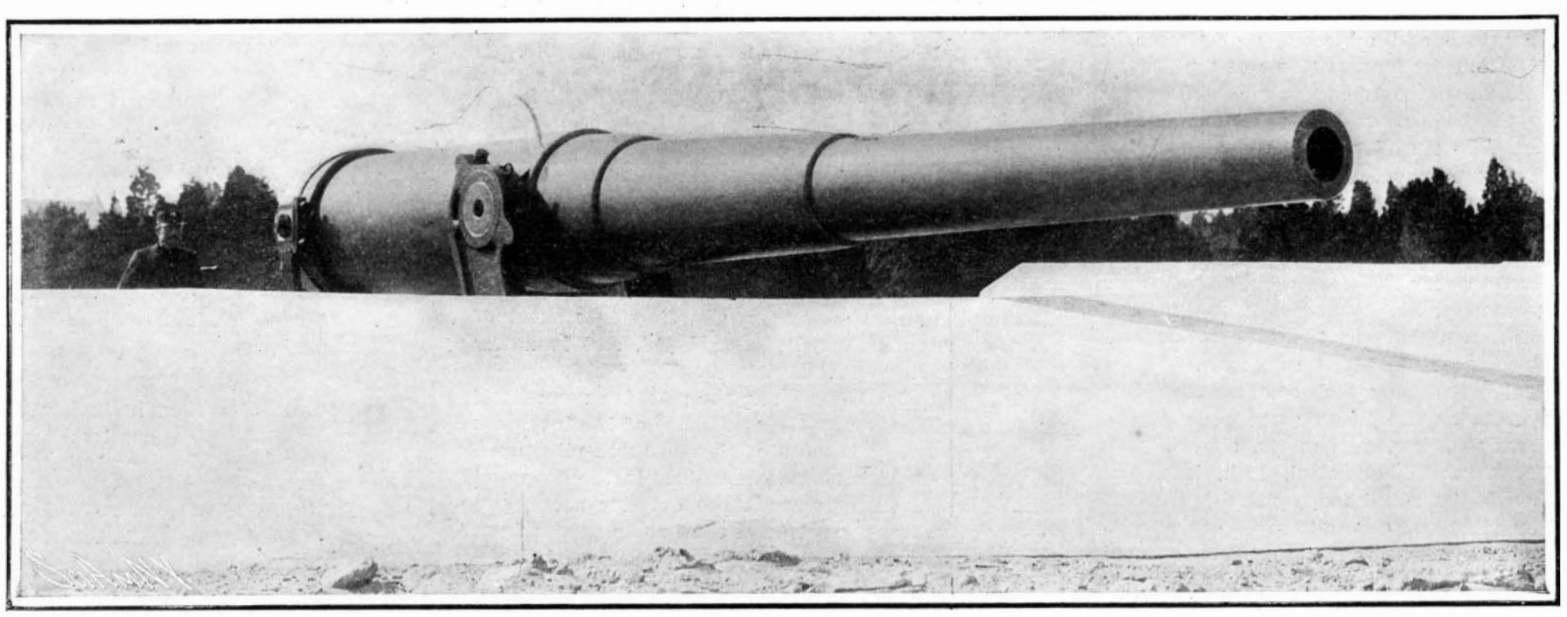
The principal methods of mounting seacoast guns are the casemate, the barbette, and the disappearing mount. In the casemate system the gun fires through an opening in the masonry or metal wall of the fort, and may, or may not, be protected by a shield. This is a very complete system of protection; but it has the disadvantage that the arc of fire is generally somewhat limited. A gun mounted *en barbette* is so placed that though part of its mount is below the parapet of the fort, the gun and upper part of the carriage are constantly exposed to the direct observation and fire of the enemy. In this form of mounting the greater part of the gun detachment is exposed to direct fire. In the disappearing system, on the other hand, the mount is entirely below the parapet and fully screened from observation. The gun itself lies also below the parapet during the operations of loading and training, and the whole of the gun detachment is also similarly sheltered.

The carriage is of what is known as the front-pintle form, and its general construction is as follows: The gun is carried, by means of its trunnions, upon the upper ends of a pair of massive rocking levers, one on each side of the gun, which are themselves pivoted at their mid-length to the top sliding gun carriage. At the opposite end of these levers is suspended by means of a pair of rods a massive lead counterweight, which is sufficient, when released, to depress the outer ends of the two levers, which, pivoting at their center on the top carriage, serve to raise the gun to the firing position. Near the breach of the gun are pivotally-connected a pair of elevating rods, which coact with the trunnion levers in steadying the gun and keeping it in its proper relation to the carriage, as it is raised or lowered. The top carriage is formed with two hydraulic cylinders, one on each side, in one piece of gun iron. In each cylinder are two throttling bars of steel, which pass through notches in the piston, and serve to regulate the size of the orifices for the flow of the liquid past the piston, and present an increasing resistance to the recoil of the gun. The action of the system in recoiling is such that no matter at what elevation the gun may have been fired, it will have practically the same inclination to the horizontal, about seven degrees, when in the loading position.

The racer is of cast steel, and the base ring of gun iron. The base ring is fastened to the platform with a large number of heavy holding-down bolts. The traversing of the gun is accomplished by means of cranks operated by hand, and the elevation by means of elevating hand-wheels, mounted on a shaft passing through the mount, upon which are pinions of bronze, gearing into spur-wheels of cast steel. On the shaft with these are pinions of bronze, which gear into elevating racks attached to the lower end of the elevating rods.

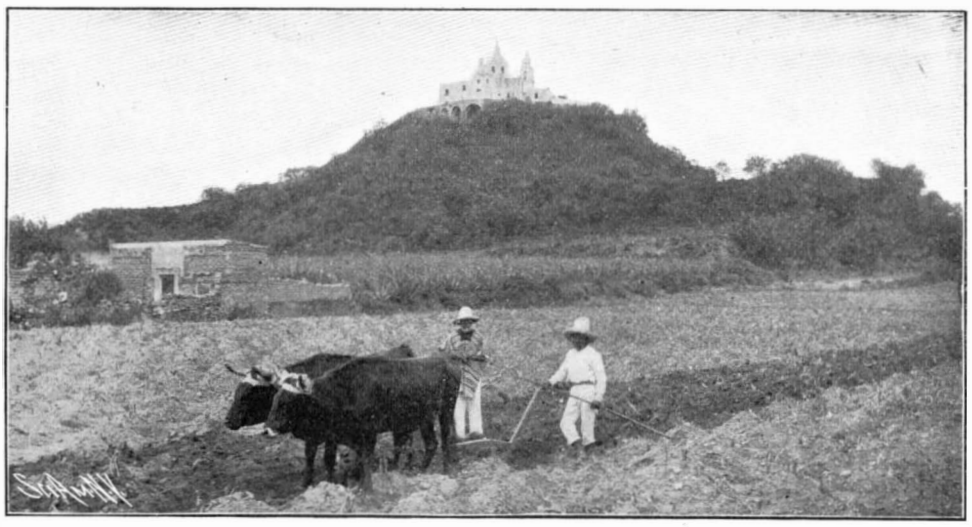
When the gun is in the lowered position, it will be evident that all the operations of sponging, loading, traversing, and elevating may be carried through without exposing any of the gun detachment, except the man at the telescopic sight, whose head will be exposed above the line of the parapet. The breech of the gun in the lowered position is always at a predetermined height above the platform, so that when the ammunition is brought forward on its truck, it is at just the right height to be thrust from its tray into

(*Continued on page 322.*)



This view shows how little of the mount is exposed.

DISAPPEARING 10-INCH BREECH-LOADING RIFLE, IN THE FIRING POSITION.



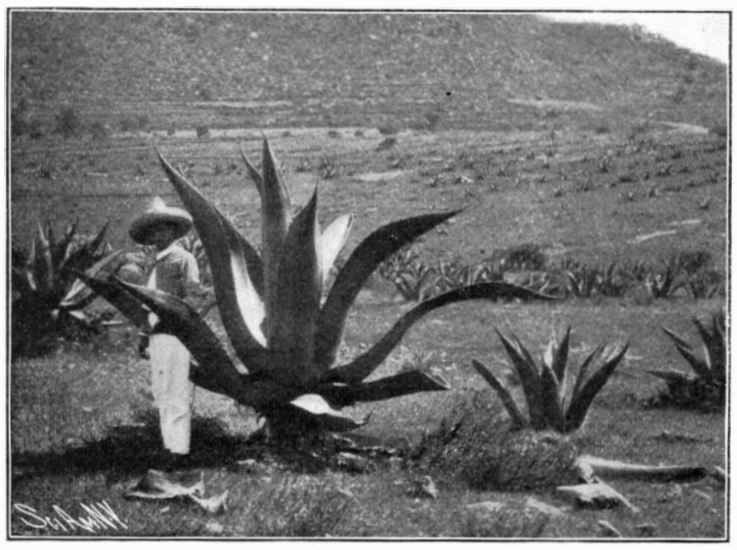
The Famous Pyramid of Cholula Near the Volcano.

The Port of Vera Cruz, from Which the Sulphur is Exported.

THE VESUVIUS OF AMERICA.

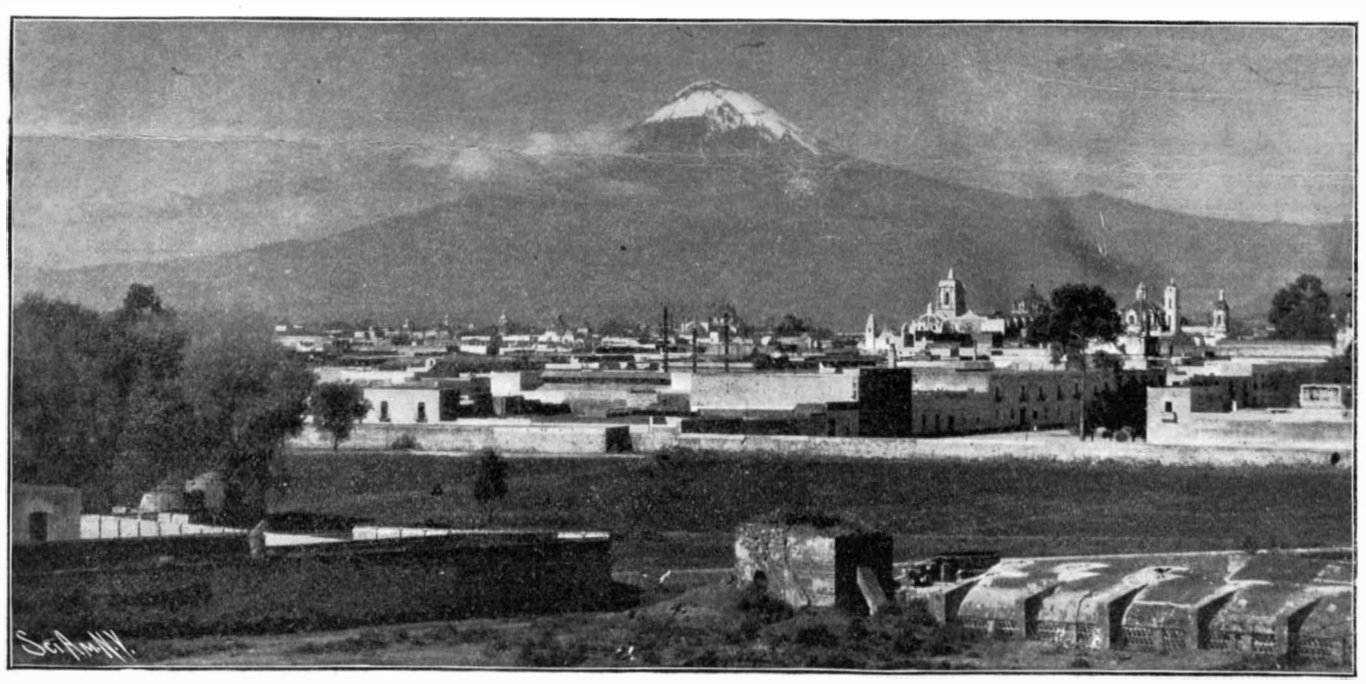
BY DAY ALLEN WILLEY.

Every traveler through Old Mexico hears of one spot which is more attractive to tourists from abroad than any other. This is the volcano of Popocatepetl. Some have called it the "Vesuvius of America," owing to the frequent eruptions which have marked its history; but unlike Vesuvius, its crater has been entered by man, and, remarkable as it may seem, here has been for centuries the site of a great natural industry. Popocatepetl has been producing sulphur probably for ages, according to the opinion of geologists and other experts who have examined the interior of the crater as far as it has been possible to venture with safety. True, it is by no means an extinct volcano. By day clouds of steam and smoke arise from the summit of the mountain, and at times in the night the sky above is illuminated by the glow from the fiery mass whose existence is revealed through the occasional vent here and there in the temporary bottom of the crater. It is a strange sight to witness human beings toiling in this abyss day after day, extracting the sulphur ore, as it is called, with pick and shovel, and "packing" it on their backs to the edge of the crater where it is hoisted to the top. Some of the peons have labored in these depths 550 feet beneath the earth's surface for the greater part of their lives, since sulphur mining, as it is called, has been carried on in the bowels of Popocatepetl for four centuries; yet no one knows when an eruption may occur which would destroy every living thing for miles around.



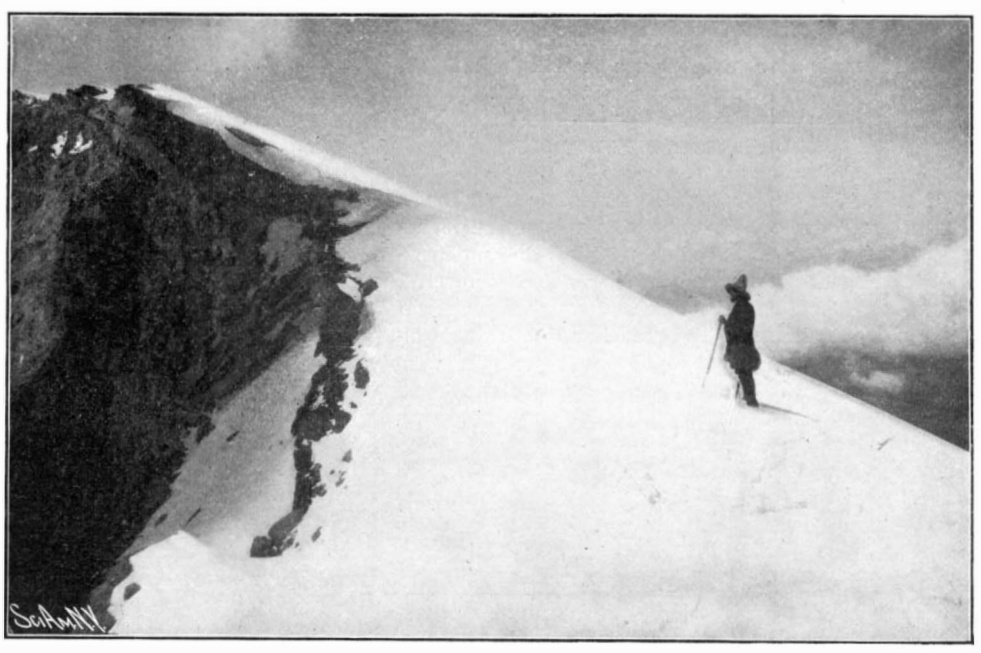
Scene in the Vicinity of Popocatepetl.

From where they toil, the workmen can clearly discern the fissures whence the escaping sulphur fumes and smoke prove that beneath them there is a furnace of nature; but were it not for the crevices the accumulation of the sulphur deposit would cease, for they form a portion of the great natural laboratory in which this material is compounded. The history of Mexico proves the age of this industry, for Cortez obtained sulphur, probably from the summit of the volcano, to use in manufacturing gunpowder for his soldiers. Since that time, the substance has been obtained by the natives when the volcano was not in such a state of activity as to keep them from approaching it. For several years recently a considerable quantity has been secured, although by a very crude method. As already stated, the beds are worked by hand labor, the sulphur being placed in bags containing 25 pounds each. They are placed on the backs of human packers who carry them to the foot of the crater and attach them to a rope suspended from the top. Then each is hoisted singly by means of a windlass. At the top the bags are given to other peons who seat themselves on straw mats and slide over the snow which covers the outer portion of the mountain to the timber line. At this



General View of the Volcano from the City of Puebla.

Peons Carrying Sulphur to Timber Line by Sliding Over the Snow.



View of the Crater Which Forms the Greatest Sulphur Mine in the World.

point the sulphur is placed on mules to be transported to the railway station about nine miles distant.

Various estimates have been made of the quantity of sulphur which at present exists in the crater, some figures placing it at fully 100,000,000 tons. Von Humboldt, who made an exhaustive study of the interior of the volcano, gave the opinion that the bed is the largest in the world. A commission of experts appointed by the Mexican government, however, made a careful study of the crater and confirm the statements that the quantity of sulphur is undoubtedly enormous. These reports have led to such an interest being taken in Popocatepetl that it has actually become American property and the flag of the United States is probably ere this floating above its summit, for a company of capitalists from the States have actually purchased this great factory of nature and intend mining the sulphur on an extensive scale.

Consequently the famous mountain has become a subject of more than usual interest. As is well known, it is one of the highest peaks on the American continent, reaching to a point 17,520 feet above sea level. The crater itself is somewhat unique, since its present form resembles a bell rather than a cone, to which most craters bear a similarity. The opening is 2,700 feet at its greatest diameter, which is from east to west, while the greatest diameter at right angles to this line is 1,200 feet. The rim of the crater is considerably lower on the side toward the city of Puebla, which is situated within sight of it. At this point the hoisting windlass has been erected. From the hoisting platform to the floor of the interior, as already stated, is no less than 550 feet, of which 225 feet comprises a wall, which is practically vertical. Fortunately the walls are formed of the trachytic and porphyritic rock, covered at the summit by a lava which has been thrown out in past eruptions. The lava rock has assumed such a curious shape that the rim near the hoisting side is popularly known as the "Devil's Spine"—a very proper term. That the sulphur is continually being formed is shown by an examination of the bottom of the crater near the fissures. Here the rocks have been found covered with a layer of powdered sulphur recently deposited. From time to time openings have been made in the mass of debris which has accumulated in the crater as the result of eruptions. These pits have revealed masses of sulphur ranging from 6 to 10 feet in depth. The commission of Mexican experts has traced the deposits, covering spaces which represent nearly half a mile in area, while borings indicate a depth ranging over a thousand feet. The quantity of sulphur secured during the last thirty years, however, gives possibly the best conception of the extent of this curious industry, for it amounts to 10,000 tons, although every pound was taken from the deposits and carried away from the mountain by men and animals.

When the plans of the new owners are carried into execution, the crater will become the site of a most interesting series of operations. Arrangements have been made to install pneumatic machinery which will cut away all of the rock formation which can be reached. It is then believed that the sulphur can be obtained merely by the use of the pick and shovel, since it exists in such a loose formation. A tramway will be built along the floor of the crater with tracks reaching the principal workings. As the sulphur is mined it will be loaded into cars and hauled to the foot of a cableway consisting of a series of huge buckets, traveling along an endless wire rope. As fast as the buckets are filled with sulphur, they will be hoisted to the edge of the crater, thence carried down the mountain to a refinery which is to be built at the foot. Here the impurities will be separated from the sulphur and it will be transported by another cable system to the Interoceanic Railway, whence it will be shipped to the city of Vera Cruz, the nearest seaport.

DISAPPEARING COAST-DEFENSE GUNS.

(*Continued from page 320.*)

the breech. The action of the carriage is as follows: Upon firing the piece the central pivot of the levers moves horizontally to the rear, carrying the top carriage with it. The lower end moves vertically upward, being constrained by the crosshead guides. The gun moves downward and to the rear in the arc of an ellipse. The energy of recoil is absorbed partly by raising the counterweight and partly by the resistance of the hydraulic cylinders. After loading, the pawls are tripped, and the greater moment of the counterweight enables it to raise the piece into battery. The return to battery is softened by the hydraulic counter-recoil buffers in the cylinders, forming a sort of dash-pot.

An attacking fleet would be practically at the mercy of such a battery of disappearing guns. At the outset it would be ignorant of the location of the fort; and the use of smokeless powder would render the detection of the guns, during the few seconds that they showed above the parapet, a difficult matter. The only possible chance to place a shell inside the fort would be by making use of high angle fire; and this is impracticable in the modern warship as at present constructed, for two reasons: first, that the existing gun carriages will not allow the breech to be sufficiently depressed to admit of such fire; and, secondly, that the existing decks are not strong enough to withstand the heavy vertical strain of the recoil. The aiming of the gun is all done under shelter. By means of a "range finder" and the "converter board" the gunner can lay the piece with perfect accuracy while it is yet below the level of the parapet. Gun for gun, such a battery has an enormous advantage over the floating fortress, for it would have in its favor: 1. Invisibility. 2. Absolute protection from gun fire. 3. Absolutely steady platform. 4. Absolute determination of the range and bearing of the enemy. To this must be added the moral effect upon the courage and endurance of the gun crews, resulting from their superior protection.

The Current Supplement.

The events which are now occurring in the Far East lend a peculiar interest to the launching of the new first-class battleship "Kashima." Harold J. Shepstone describes the ship in the opening article of the current Supplement, No. 1529. A demand exists for posts that are strong, convenient, durable, and cheap, particularly in those parts of the country where timber is difficult to obtain. C. L. Catherman believes that cement posts admirably answer all requirements, and presents convincing arguments to uphold his view in an instructive article. Dr. O. N. Witt presents another one of his instructive papers on Patina, giving explanations that are wonderfully simple. "Friction Clutches" is the title of a most exhaustive discussion by George A. F. Pover. The so-called main spring of a watch finds manifold application as the cheapest and simplest means for mechanically driving simple apparatus. Emil Riedel tells how the motor spring is to be calculated. A highly suggestive lecture was recently delivered before the Royal Institution by Prof. J. J. Thomson on the Structure of the Atom. An abstract of the lecture is published in the current Supplement. For several years American engineers have bent their energies to the designing of a simple and safe single-phase alternating-current railway. Mr. A. Frederick Collins describes the first successful American road of this type. Jeanette Macdonald presents a vivid picture of a California Hop Garden. Prof. Charles Fisher publishes a description of the objects belonging to the later Greek period, showing their marked differences from the Babylonian type, and contrasting them with the objects of the first Greek or Mycenaean period. The first of three papers by the late Alfred J. Hipkins is presented, the installment describing stringed or musical instruments without keyboards.

Population of the Philippines.

The total population of the Philippine archipelago as returned from 342 independent islands is 7,635,426. Of this number almost seven million are more or less civilized. The wild tribes form about 9 per cent of the entire population. The civilized tribes are practically all adherents of the Catholic Church. The Moros are Mohammedans, and the other wild peoples have no recognized religious beliefs.

The total population, according to the most reliable authorities, is a little more than four times as great as it was one hundred years ago. During the same period that of the United States multiplied almost fifteen times. The excess of birth rate over death rate in the Philippines has been large, in spite of sudden and great losses as a result of epidemics of various diseases.

While it is true that the enumeration of the wild tribes, according to the methods employed among civilized peoples, was not practicable, very careful and painstaking estimates were made, and the returns are probably within 10 per cent of the true number. The total number of non-Christian peoples is stated to be 647,740.

A "Bureau of Authenticity."

Owing to the prevalence of spurious but often deceptive imitations of old and of contemporary masters, the Society of Friends of the Luxembourg Museum, under the patronage of M. Dujardin-Beaumetz, Under-Secretary of State for Fine Arts, is about to organize a "bureau of authenticity" for works of art. A number of experts are to be attached to the bureau, duly provided by the Prefect of Police with the full authority of police magistrates. There is to be a thorough search, high and low, for falsified pictures and statuary. The idea is new in France, and its application will meet with almost insurmountable difficulties, but M. Dujardin-Beaumetz is confident that with patience and indefatigable perseverance these will in due time be surmounted. —New York Tribune.

Correspondence.

About the Moving Stone Ball.

To the Editor of the Scientific American:

Noticing the article in your paper this week regarding the stone ball on the monument moving spontaneously, I make free to express an opinion on it.

I think the theory that the ball becomes more heated than the base is wrong, as the ball is polished, whereas the base is finished with a rough surface; it would therefore look to me that the base becomes more heated, and expanding somewhat, "bites" the ball slightly on the south side, and in contracting when cooling again, draws the ball down a little to the south. John Goodsmith.

Washington, D. C., April 13, 1905.

The Projections on the Old Chinese Temple Bells.

To the Editor of the Scientific American:

In the issue of April 8, article "Some Remarkable Old Chinese Bronzes," the writer speaks of the thumb-like projections on the temple bells as being for the purpose of adjusting the sound. Many Chinese and Japanese bells have similar projections, but in every one of them these are above the sound bow of the bell. This would not be the case if the above theory were correct. An educated Japanese gave me another reason, to wit: Once upon a time Buddha was so engrossed in his meditations that he did not observe the sun's beating down on his bare head. The snails, seeing his plight, covered his scalp with their slimy bodies and prevented his having a sunstroke. Since then Buddhist bells that were cast had these twisted protuberances, while those of beaten metal have been covered with small convex bosses.

Washington, April 10, 1905. E. H. Hawley.

Death of Col. Nicolas Pike.

Col. Nicolas Pike, soldier, author, and naturalist, descendant of a line of scientific men, and a relative of Capt. Zebulon R. Pike, for whom Pike's Peak is named, died on April 11.

The Pike family were Puritans, landing in New England in 1635. Col. Pike was born in Newburyport, Mass., eighty-seven years ago. In early manhood he settled in Brooklyn, where he first identified mastodon bones and teeth exhumed near Jamaica. Through Daniel Webster he obtained the appointment as United States consul in the island of Mauritius, in the Indian Ocean, where he made a great collection of birds, fishes, algæ, and shells. He presented to Cambridge University more than 800 drawings of the fish of the Indian Ocean, and received letters of thanks from Prof. Agassiz. His work, "Sub-Tropical Rambles in the Land of the Aphanapteryx," dealt with Mauritius. Upon returning to this country, his home in Clinton Street, Brooklyn, became a Mecca for students of natural history.

In the civil war he organized an engineer regiment and did notable work in adapting photography to the needs of the army. Among the curiosities he leaves is a three-sheet autograph letter from Washington to his uncle, Nicholas Pike, commending him as the author of the first arithmetic published in the United States. He also possessed the camp chest presented to Dr. David Livingstone by Sir Moses Montefiore.

Col. Pike was a very well-known figure in the office of the Scientific American. For years he contributed articles on various subjects of natural history to its columns. It was always a pleasure to see this rugged old gentleman enter the editorial sanctum, bringing with him a light heart, a sparkling eye, and the vivacity of youth.

He was a magnificent specimen of humanity, with his deep chest and active physique. Even after the age of eighty he would frequently appear at the office after having had a six or eight-mile walk, but with his cheeks flushed with the glow of health.

Those who were accustomed to his visits will for a long time miss the influence of his buoyant nature and always cheering presence.

Opening of the Simplon Tunnel.

The Simplon tunnel was opened on April 2, when from the Swiss and Italian sides the first trains passed through, meeting at the center. Herr Brandau, the engineer who had directed the work on the tunnel, conducted the Italian train, which was lighted part of the way by miners with lanterns. The train from the Italian end was the first to reach the iron door at the center, but a little later the train from the Swiss end was heard on the other side. There was a brief time spent in communicating by means of hammering, and then the door was knocked down amid frantic applause and cries of "Long live Switzerland" and "Long live Italy." Bands played the Italian royal march and the Swiss anthem, and the two parties embraced and kissed each other. Herr Brandau shook hands with Herr Rosemund, the director of the work on the Swiss side, and Italian Bishop Novara embraced the Swiss Bishop Sion. The latter bishop preached a short sermon, and blessed the tunnel.

A LEADLESS SOUNDING APPARATUS.

BY DR. ALFRED GRADENWITZ.

An ingenious apparatus for determining the depth of the sea without being in actual touch with its bottom has recently been invented by a Norwegian engineer, Mr. H. Berggraf. The particulars in the following account, as well as the illustration, are taken from Elektroteknisk Tidskrift, Copenhagen.

As generally understood, it is a comparatively simple matter to measure the depth of the sea. All that is necessary is to fasten a weight to a line, drop it overboard, allow it to sink to the bottom, and measure the length of line run out. And in fact all the measuring apparatus hitherto devised is based on this method of procedure, though in some cases the actual arrangement is more complicated to overcome the many difficulties encountered in practice.

The most useful arrangement would evidently be such that the depth of water under the vessel at any moment would be registered on a dial. An apparatus of this kind, besides being extremely convenient, would possess the highest scientific value for topographic measurement. Moreover, it would be invaluable as an aid to navigation, for while a single reading of the depth may apply to numberless points on the chart, a series of continuous readings can apply to but one given line.

The apparatus invented by Mr. Berggraf is designed for continuous recording of this kind. The underlying principle is one of acoustics, the propagation of a sound wave from the vessel to the bottom of the sea and back, and the measurement of the time required for this. Substantially the action is as follows: A sound wave is emitted by the closing of an electric circuit which at the same time starts the index moving across the dial. The index continues its movement until the sound wave is reflected and returns to the apparatus. When this occurs a second circuit is closed, which thereby stops the movement of the index. It is evident that the greater the distance to the reflecting surface, the longer will be the travel of the index and that its movement is directly proportional to the distance between the vessel and this sound-reflecting wall—in this case the bottom of the ocean. The apparatus may be so constructed that an alarm is sounded when the water shallows to a certain depth, and by this alarm the danger of grounding would be considerably decreased.

Instead of using a graduated dial, it is more convenient to have the record automatically marked upon a moving strip of paper. This is the arrangement in the "bathometer" as constructed by Mr. Berggraf. The illustration shows the details of the apparatus.

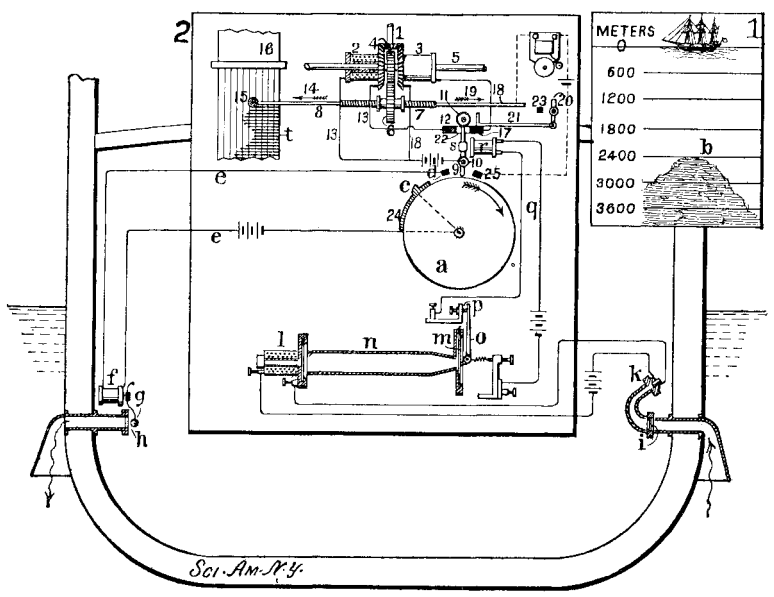
The disk *a* rotates relatively slowly in the direction of the arrow. The projection, *c*, at a given time comes into contact with *d*, completing the circuit, and causing the hammer, *g*, of the electro-magnet to strike the diaphragm, *h*. This projects sound waves against the bottom of the sea, whence they are thrown back to the vessel and transmitted through the diaphragm, *i*, to the microphone, *k*. In the circuit of the microphone is inserted an apparatus, *l*, designed on the same principle as a telephone. Because of the resonance tube, *n*, the mechanism responds only to the vibration to which it is attuned, and is insensitive to foreign sounds. As the sound emitted has a period corresponding to that of the resonance tube, the membrane, *m*, will vibrate strongly, closing the circuit, *q*, through the arm, *o*, and the screw, *p*. The electromagnet, *r*, included in the circuit, *q*, then attracts the armature, *s*. To ascertain the depth of the sea it is now necessary to measure the time that has elapsed between the transmitting and the receiving of the sound.

The shaft, 1, turns continuously while a gear wheel, 4, is free to move on the axle, 5. The wheel, 4, alternately acts as armature to the two electromagnets, 2 and 3. The direction of rotation of 4, and also of the spur wheel, 6, depends upon whether one or the other of the electromagnets attracts 4 in its capacity as armature. Correspondingly the rod, 8, receives an advance or retrograde movement by means of the screw, 7.

At the same time that *c* comes into contact with *d* and starts the sound waves on their travels, one end, 9, of the double lever is actuated. The latter is free to move about 10. The contact roller, 11, will be shifted on to the contact plate, 12, thus closing the circuit, 13. The electromagnet, 2, then attracts the armature, 4, and the rod, 18, moves in the direction of the arrow, 14. On one end of the rod, 8, is mounted a recording pencil, 15, which inscribes a straight line on the paper strip, 16.

When the sound wave returns to the receiving apparatus, the electromagnet, *r*, will be energized and attract the armature, *s*. The contact roller, 11, will then be shifted on to the plate, 17, and the circuit, 18, closed. The magnet, 3, is then excited and attracts 4, thus moving the rod, 8, in the direction of the arrow, 19. If 8 strikes against the arm, 20, of the double lever, the arm, 21, will shift the contact roller into the neutral position, 22, when the circuit, 18, being broken, the motion of the rod, 8, is stopped. This whole process above is repeated at each revolution of the disk, *a*.

Should the vessel enter shallow water, the magnet, *r*, is energized before the rod, 8, leaves 23, and the metal strip, 24, makes contact between 25 and the arm, 9, thereby setting off the alarm bell.



A LEADLESS SOUNDING APPARATUS.

A Modern Ventilating System for the Capitol.

BY DAY ALLEN WILLEY.

In the Capitol at Washington five hundred persons occupy the chambers of the Senate and of the House of Representatives during the period when Congress is in session. They spend fully six hours daily on an average in these apartments, and consequently require a large quantity of fresh air if the hygienic conditions are properly observed. Until recently the open window and steam pipe were depended upon principally for changing the atmosphere, but at last a system has been installed which has proved to be so satisfactory, that it may be adopted extensively in public buildings throughout the country. To a certain extent it is modeled upon that employed in the Houses of Parliament in London, but differs in the manner in which the air is distributed, and in some other essentials.

In considering how to secure the proper volume of pure air, the sanitary engineers had to study not only the arrangement of the Capitol building, but its location. While Capitol Hill is one of the highest elevations in Washington, it has been excavated to a considerable depth to provide the necessary space for committee rooms, restaurants, and other apartments, to say nothing of the many corridors which ramify this section of the great building. The air from the passageways is no better than that in the chambers above, since it is being continually breathed by the hundreds of attendants as well as the outsiders, who are continually coming into the committee rooms. After a careful study of the situation, it was decided to construct a duct through a portion of the sub-basement, and connect it with a series of air shafts, which would be entirely independent of other portions of the building. This duct is in reality a tunnel, in some places large enough for three persons to walk abreast without difficulty. It extends from a point in the Capitol grounds near Pennsylvania Avenue, the inner end terminating nearly under the center of the building. It is massively constructed of brick, and the inner surface coated with whitewash for the purpose of cleanliness. The inner portion is curved into an elbow, into which is set a Sturtevant fan, operated by a 40-horse-power electric motor. The fan furnishes sufficient suction to draw the air from the outside through the duct at the rate of 1,750 cubic feet per minute. After passing through the fan, the air enters a chamber which is provided with several openings in the top, each forming the mouth of another and smaller duct, which conveys it to the conduits distributing it to the chambers. These conduits are metal pipes constructed under the floors of the apartments.

It may be unnecessary to say that each member of Congress is provided with a desk, the desks being arranged in a great semicircle fronting the Speaker or the President, and raised upon successive platforms like the tiers of seats in a theater. The desks are stationary, and are provided with revolving chairs, which are also set into stationary pedestals. The bottom of the side supports of each desk is hollowed out, and a ventilator set in them connected with the air duct in the floor beneath, thus allowing the air current to flow through the box and out of the grating. One or more of the legs of each chair is also attached to a ventilating tube, and provided with a similar grating. In this way the occupant of the desk is supplied with fresh air from two sources, while the space covered by the ventilators is so large, that pure air enters all portions of the rooms served by the system.

It is of course necessary to maintain a healthful temperature, especially in winter, and in order to heat the air to the required degree, special apparatus is provided. Before the air passing through the duct from the outside reaches the fan, it is drawn between a grating of pipes filled with steam at a high pressure. The pipes are fastened in a row extending from the top to the bottom of the duct, and are so close together that the space between each represents but a fraction of an inch. Thus the temperature of the current is raised to a considerable extent, but before it enters the Senate chamber, for example, it comes in contact with a series of six coils of steam pipe, by which it can be heated to the extent desired, even in the coldest weather. As an illustration of the efficacy of this method, it may be said that air which enters the duct at a temperature below freezing point can be raised to 60 degrees before it has passed through all of the coils, and what might be called the heater grating adds from 10 to 15 degrees alone.

The entire system is controlled in such a manner, that the engineer in charge of the ventilation can regulate every portion of it without leaving his station. Each of the steam coils, for example, is operated by means of an electric governor, and the steam can be shut off or turned on by the opening or closing of the switch in the engineer's room. The six switches controlling the coils are placed on an ordinary switchboard, while in connection with each is an electric thermometer, so that by merely pressing a button the operator can tell the exact temperature in the vicinity of each coil, as it is registered on a dial above the button. The thermometer system, however, extends throughout the apartments ventilated as well as along the air duct and the various passages leading to it. For example, one gives the temperature of the street, another the temperature at the heater grating, while another indicates the degree to which the air has been heated in the chamber connected with the fan shaft.

It may be said incidentally, that the members of Congress have a decided difference of opinion as to the manner in which the chambers should be heated. The Southern members, as might be expected, usually prefer more heat than those from more northern latitudes, and sometimes amusing controversies occur as to the proper ventilation. The air pressure is so moderate, however, that when the fan is in operation, the current passing through the desk grating, for example, is not strong enough to create a draft, and if a person places his hand a few inches away from the grating, it is difficult to detect any movement of the air.

The rules are drawn up for the concourse of electric cabs which is to be held at Paris next May. The competition will bear upon the cost of running per day, the comfort, manipulation, and easy running of the vehicles, as well as the total cost. The vehicles in question are to be of the ordinary type which is designed for city and suburban use, and must be able to cover 60 miles per day. All systems of electric cabs will be admitted. These will be divided into three classes according to total weight and capacity. The first class is to carry two persons and weigh less than 2,900 pounds; the second, four persons and 3,500 pounds, and the third, six persons and 6,000 pounds with a place for baggage overhead.

Although the number of vehicles to be entered is not limited, the same constructor cannot enter two vehicles of the same type and dimensions. The entry fee for each vehicle will be 20 francs ($4) up to the 15th of March, and after that date it will be raised to $8. The entries will be closed on the first of May. At least ten days before the concourse each constructor is to give the necessary data to the committee, relating to the plan of the vehicle and motor, the distribution of the weight upon the axles when the cab is empty or loaded, also the weight of the storage battery and the energy taken by the charge per day. The concourse will consist of a series of tests covering 8 days, and the cabs will be run over different circuits of 60 miles each day, either in the city or suburbs, returning to the charging station at night. A special meter will be placed on each vehicle by the Commission in order to measure the energy supplied to it. The jury consists of three members appointed by the constructors and three by the Commission. It will award gold and silver medals for the best performances. Now that the electric vehicle has been perfected and come into such wide use for city work, our constructors would do well to embrace this opportunity of demonstration abroad.

REALISM IN MILITARY MANEUVERS.

BY W. G. FITZ-GERALD.

The Titanic struggle now being waged in Manchuria between two armies, each approximating half a million of men, in which the line of battle often covers a front of fifty miles or more, has brought to a head the suspicion that the military maneuvers do not represent modern conditions, when guns may come into action at a distance of four or five miles, and small-arm fire likewise has a range formerly undreamed of.

Shortly after the Anglo-Boer war, the various chiefs of staff in the military cabinets of the world pointed out in war councils that the days of dashing cavalry charges, and the advance of infantry in dense masses was a thing of the past; and for the last year or so the great armies of the world have been steadily endeavoring to reproduce, as nearly as possible, in their maneuvers, the actual conditions of modern warfare, as they are shown in the Russo-Japanese battles of to-day.

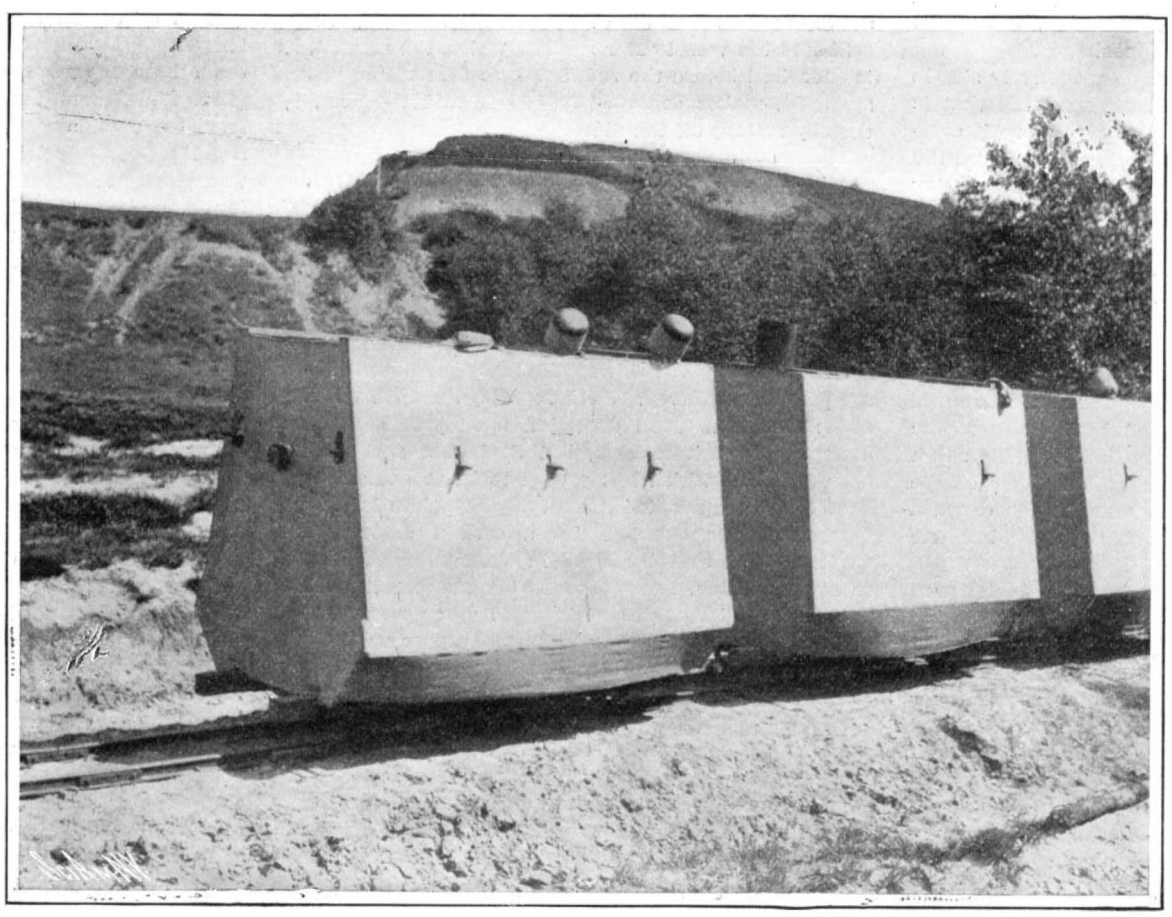
But to reproduce these conditions calls for vastly extended territory—a difficult and costly condition in the case of a very small country like Great Britain. It has been found that the famous military camp at Aldershot is altogether too circumscribed in area for the reproduction of the actual war conditions of to-day. Hence the British war department has acquired immense tracts of land on Salisbury Plain.

The French war office, as well as the military departments of Germany, Austria, Italy, and Russia, are also expropriating vast tracts of land, which are chosen not only on account of their great size but also by reason of their remoteness from human habitation, and the presence of "cover," rocky dells, hills, and other "conditions."

On Salisbury Plain the British government has laid down a portable railroad on which is run an armored train. One can imagine nothing more curious than to see these queer khaki-colored steel trucks flying along at five and twenty miles an hour under a perfect hail of shot and shell from an invisible "enemy." And yet, the train only contains two living persons—one the driver, and the other a recording officer, whose duty it is to report the number of hits and the general result of the fusillade.

Out of the top of the train, however, stick dummy heads of supposed soldiers, and concealed marksmen on either side of the line take very careful aim at them—for it should be said here that the most important innovation of all is the doing away with the old blank-cartridge system, whether in heavy ordnance or in small arms, and the substitution therefor of ball cartridge and live shell. So severe were British losses in the Boer war from attacks on farmhouses and other dwellings, that the British have erected several most curious structures of canvas and iron framework to represent houses of all kinds. These are defended by troops concealed in pits on the floor of the house, and both they and the attackers, who are deployed over a very wide front, use ball cartridges.

Incidentally it may be remarked that the Japanese, too, have suffered very severely from defended houses in Mukden and elsewhere. The danger to the attacking force under these conditions is sufficiently obvious, and need not further be emphasized. Inside the "farmhouses" which the British build so flimsily that each bullet will make a perforation, there is one officer whose sole duty it is to take note of the number of hits, and also to direct his men's return fire. Accidents are extremely rare, so effectively are attackers and attacked protected. When it is desired to aim at the open target, naturally human beings cannot be used; but in order to reproduce the conditions as nearly as possible, "men" ten feet high and mounted upon small trolley-cars running on rails, are ranged in line, and set in motion. There are similar dummies used to represent advancing cavalry, "head on."

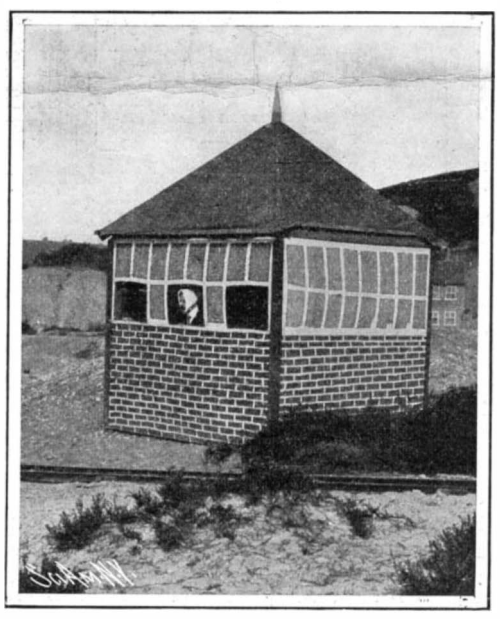


A Dummy Armored Train.

As every one knows, the military cabinets of every civilized nation are represented at the front in each war in the person of their military *attachés*. These officers, specially trained and most competent observers, bring back with them data upon which their chiefs rely to bring the army into line with the very latest conditions obtaining in actual warfare. It is then the business of the various war offices so to arrange that these conditions shall be reproduced as realistically as possible in the periodical war maneuvers.

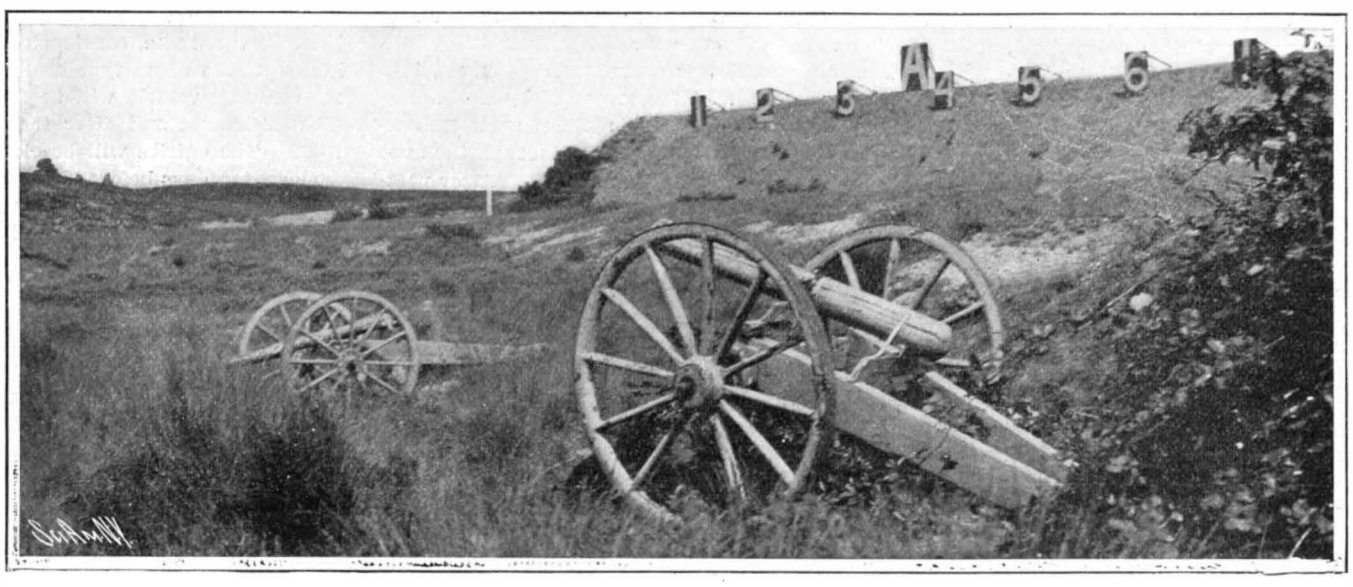
For example, both in the Boer war and the great struggle at present in progress, artillery has been so cunningly concealed that it has been next to impossible to locate it. In the war maneuvers of to-day real guns are mounted in the field in such a way that they can fire their shell and then disappear into a pit, leaving in front of them dummy cannons made of wood and mounted upon ordinary cart-wheels. These remarkable "scapegoats" are commonly pounded to pieces, so that nothing remains of them but the merest fragments.

There can be no doubt that the termination of the present war will see yet another change, even in the most realistic war maneuvers of to-day. It is common knowledge that *attachés* of the military powers of the world are constantly forwarding to the various war offices voluminous reports and suggestions; but so important and far-reaching are the changes involved or suggested, that it is probable the war departments will wait until all is over before inaugurating the new *régime*.



Dummy House Made of Lath Work and Sheet Iron, Defended by Troops and Attacked by Others Using Ball Cartridges.

Inside are special officers in ditches to register the percentage of hits.



Dummy Guns Made of Wood Are Placed in Position on the Field. A Firecracker or Two is Attached, Revealing Its Presence. Often the Wooden Guns Are Blown to Pieces.

THE CONCRETE AMPHITHEATER AT BERKELEY, CAL.

BY ENOS BROWN.

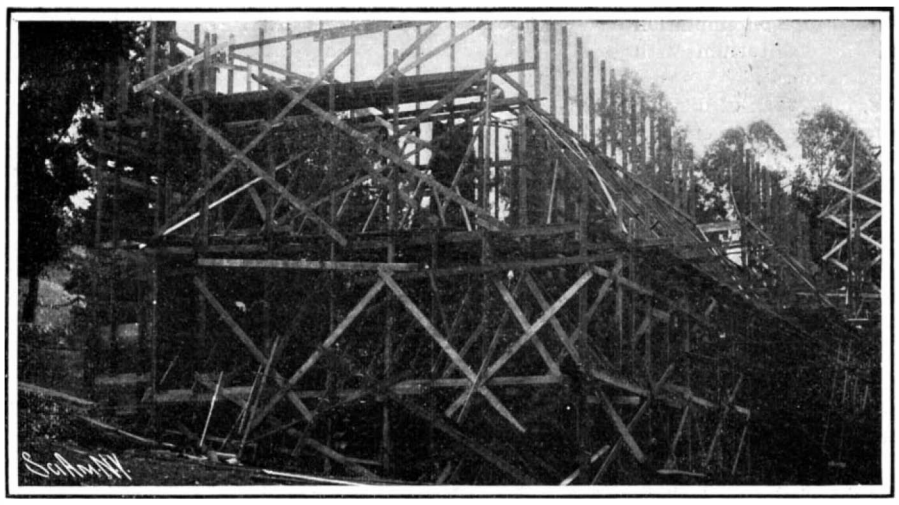
The Greek amphitheater of the University of California at Berkeley, ten miles east of San Francisco, was completed about eighteen months ago. As an essential adjunct of that great institution it has proved its utility and, structurally, its perfect success.

It has been the scene of important academic functions in which the President of the United States has taken the leading part, and witnessed the production of classic plays, performed by students in the garb of antiquity and recited in the sonorous tongue in which these monuments of Grecian literary genius were written over twenty centuries ago.

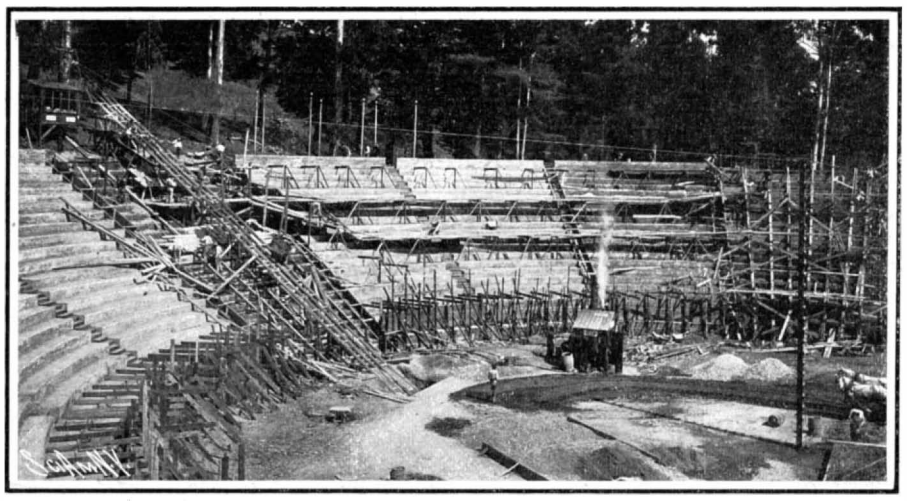
Nature provided a convenient site for this remarkable structure in one of the valleys of the university grounds, which extend in successive undulations from the base to the summit of the lofty range which forms the eastern boundary.

No institution of learning in the world has so incomparably magnificent a site or will (when the present architectural scheme is carried out) be housed in so splendid a group of structures as the University of California. The choice of a location for the amphitheater was decided by the natural advantages possessed by the little valley which, by the foresight of earlier years, had been inclosed in a thick growth of eucalyptus trees. The base formed a level platform, and from all sides the banks arose in regular ascent to a considerable height.

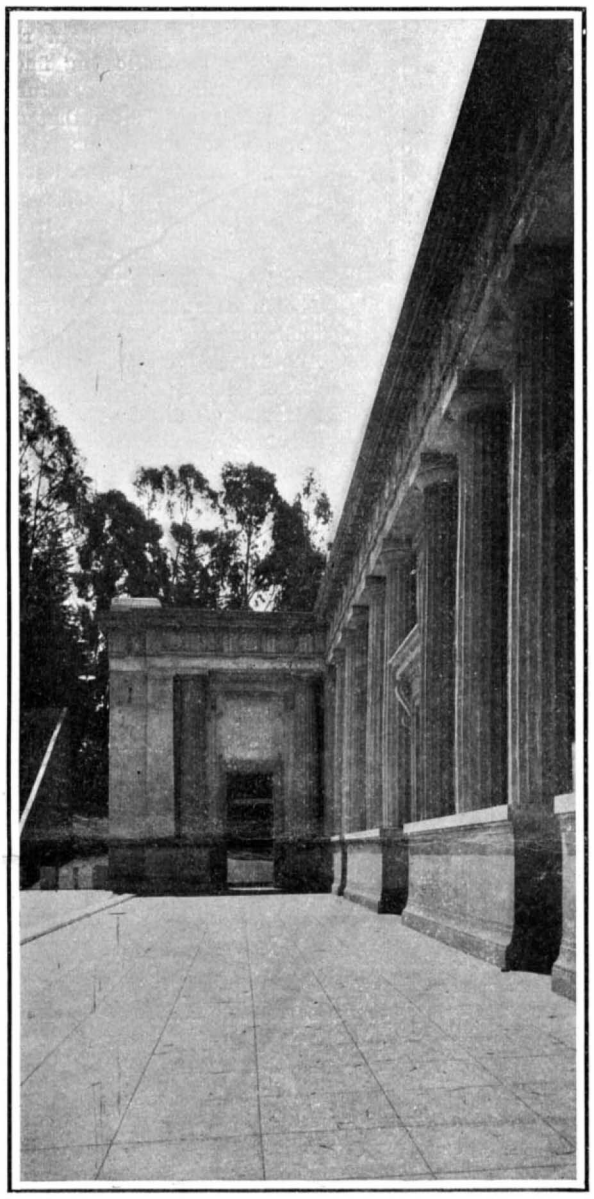
Prior to the



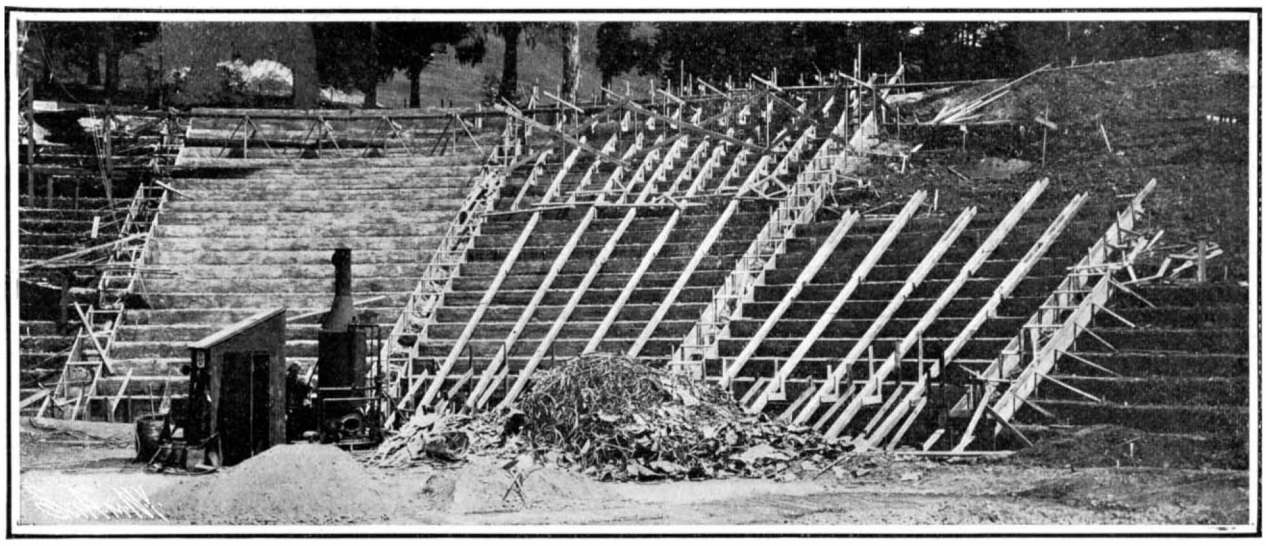
Scaffolding for Concrete Forms of Stage.



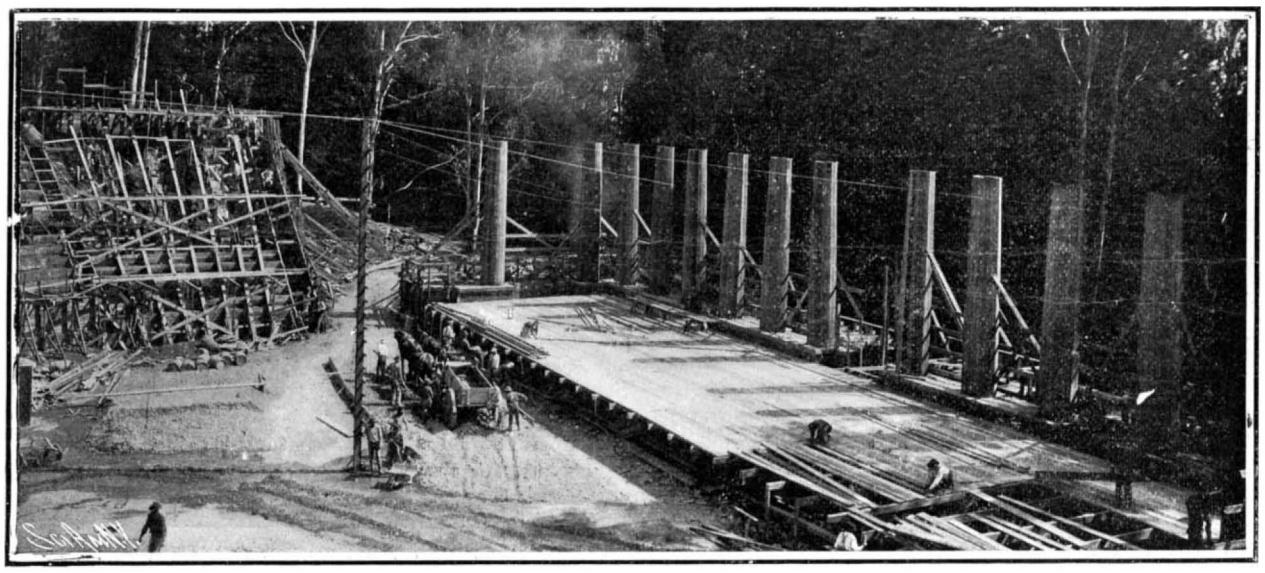
Preparing Concrete and Conveying to Steps of Amphitheater.



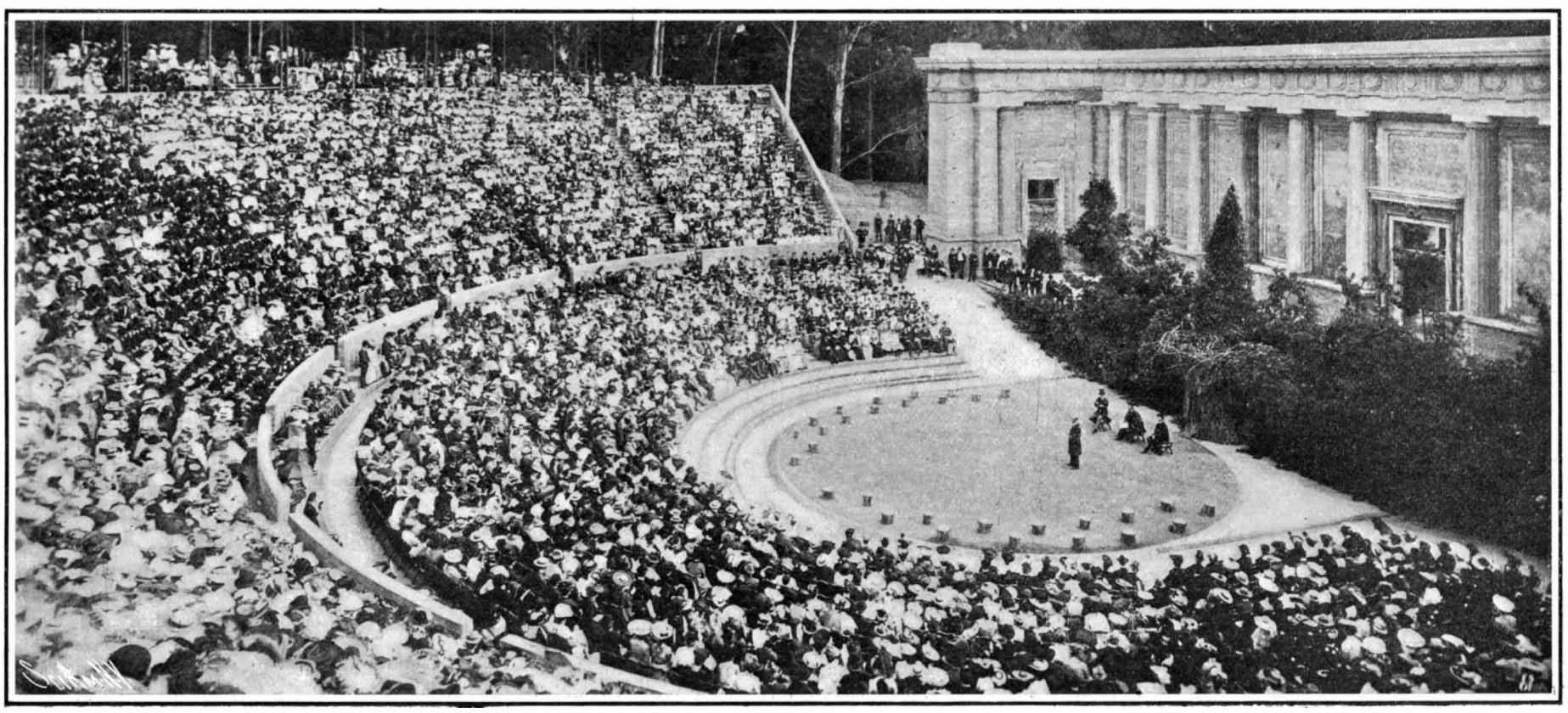
Stage Looking South.



Tiers of Seats Cut into the Embankment.—Covering Steps with Concrete.



Forms for Stage, Concrete Columns.



Class Day in Amphitheater.

THE CONCRETE AMPHITHEATER AT BERKELEY, CAL.

building of the amphitheater, the University of California had no structure large enough to accommodate its own students, much less the multitudes which at certain periods throng to the various commendatory exercises of the scholastic year.

Construction began in the middle of February, 1903, and progressed so rapidly that in May the President of the United States delivered from the stage an address that excited the rapt attention of an audience of over 8,000 people. In the following September the amphitheater was completed to its present stage, the "Birds" of Aristophanes being performed in the original tongue by a company of students.

The building is composed of two unconnected parts, the auditorium, or theatron, of the Greeks and the stage.

The auditorium is a great semi-circle, 254 feet 8 inches in diameter, with two tiers of seats. The center is a level circle, 50 feet 8 inches in diameter, and 5 feet 5 inches below the stage floor. It is distant from the stage 7 feet. The circle corresponds to the orchestra of the ancient Greek theater, the part appropriated to the chorus. Surrounding this circle rise twelve steps each 3 feet in width and having a rise of 5 inches. Upon these steps 1,600 chairs may be placed. Between the lower tier and the upper sections of seats an aisle, the diazoma, extends 9 feet in width, on an exact level with the stage floor as well as of the side entrances between the auditorium and the stage. On the outer circle of the diazoma, or aisle, is a wall 10 inches thick and 5 feet high. A bench at the foot of the inner base of the wall will seat 160 persons. Above the wall, at an incline of 30 degrees, so as to afford spectators a perfect view of the stage, rise the main seats of the auditorium arranged in nineteen rows of steps each having a width of 30 inches and an 18-inch rise. Eleven aisles lead from the lower wall and divide the seats into ten sections, the steps in the aisles being 15 inches wide and 9 inches high. A wall, two feet high and pierced by nine openings, surrounds the outer circumference. Each end of the auditorium is flanked by a retaining wall rising 3 feet above the steps and 10 inches in thickness at the top. The walls step out under the seats in 1-foot ledges to a total width of 10 feet at the foundation.

The stage of the amphitheater is the only portion of the edifice in which the simplicity of the design has permitted the introduction by the architect of a certain amount of well-judged ornamentation. The inclosing wall is faced by sixteen fluted Doric columns which support a classic cornice with triglyphs and metopes, enriched by bosses. The end walls terminate in massive pylons. There are five entrances—one at each end and one on each side of the great central door opening in the rear wall of the stage. The height of the stage floor corresponds with the elevation of the diazoma or aisle surrounding the central circle and the paradoi or entrances on each side between the stage and auditorium. The total length of the stage is 134 feet. The paneled wall on the back and ends is 42 feet high. The inside wall, following the ancient types, is designed to represent a castle or temple, and is purely classical.

The original design of the architect calls for an open parapet with clustered columns and bronze ornamentation on top of the stage wall while an encircling colonnade and covered promenade will surround the top of the auditorium. It is also in contemplation to cover the concrete work of the auditorium with stone, marble or other permanent material.

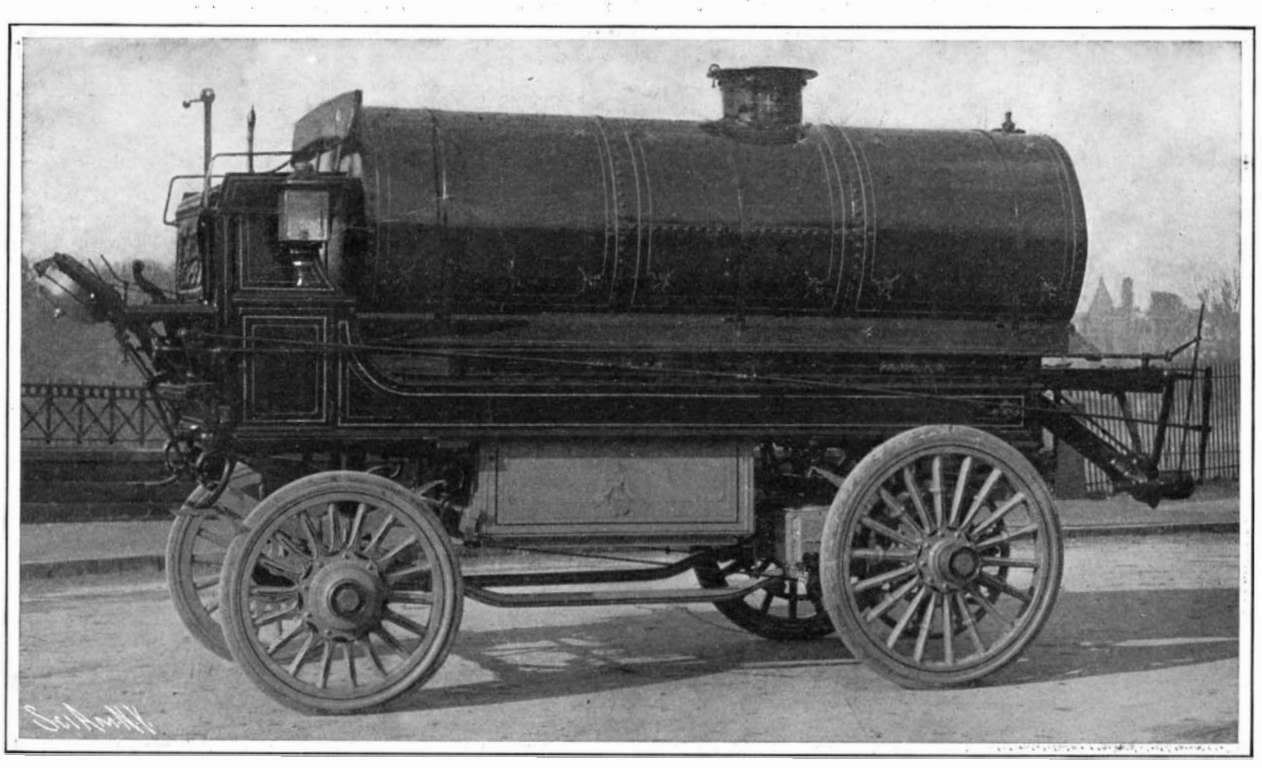
The amphitheater, as it stands, is a work of distinction. Its architectural features deserve high encomium, but the chief merit of the structure consists in the fine use of material and the success with which concrete has been employed for so complicated a purpose. The courage to undertake and erect so noted a building of concrete has been justified. The architect has scored a triumph and the builders immense credit, but the achievement would have been impossible but for the remarkable quality of the material furnished by the makers of the cement. The writer lately carefully inspected the work, going over those portions where the wear of the elements would most likely be shown, but no evidences of disintegration were to be observed. The flutings of the columns and the outlines of ornaments of the stage were as sharp and perfect as when molded. Some little subsidence was seen in the upper tiers of the auditorium, but so slight was the effect as to be hardly noticeable. The great structure looked as though it might last for centuries.

The amphitheater was the gift of Hon. William Randolph Hearst, who contributed $42,000 for its erection.

South Corner During Construction.—Form for Concrete Columns for Stage.

THE CONCRETE AMPHITHEATER AT BERKELEY, CAL.

Observations with the Portable Astrolabe.—M. Driancourt, engineer, has tested the Claude astrolabe in Madagascar, and confirms the high precision which won for it a prize in France. The determinations did not exhibit an error of more than half a second. Tests at the observatory at Montsouris tend to show that it furnishes results as precise as those of the fixed instruments of the observatories.



AN ELECTRIC STREET SPRINKLER IN USE IN HARTFORD, CONN.

Chemical Reactions at Extremely High Temperatures.

Very high temperatures may be attained by the burning of aluminium in air or oxygen. According to Prof. C. Zenghalis, in the Elektrotechnische Zeitschrift, Goldschmidt succeeded in obtaining a temperature of 3,000 deg. C. through the direct burning of aluminium by means of combined oxygen. The theoretical calculation for the burning of aluminium in free oxygen permits us to expect temperatures far exceeding this, in fact the astonishing figure of 19,062 deg. C. should be reached. The experiment was carried on in this wise: The aluminium was placed in a highly-heated crucible, and burned while passing through it a stream of oxygen. The collected data resulted in the following findings: The temperature reached is not below that of the electric arc light; platinum, lime, and magnesia melted and volatilized immediately, while the lime and magnesia further combined to form aluminates. The unconsumed aluminium took on a spherical shape. Another interesting circumstance is this: When a mixture of either powdered graphite or soot and aluminium was burned together, the result was aluminium carbide. When, instead of oxygen, nitrogen was supplied, as much as 38.57 per cent of the aluminium could be converted into a nitrite. In the presence of carbon dioxide and carbon protoxide, aluminium burnt violently at a temperature of over 1,000 deg. C., the burning of the carbon went forward without incident, and aluminium oxide or carbide was formed. N_2O and NO will react equally as violently with aluminium under like conditions, that is always presupposing a very high temperature.

AN ELECTRIC STREET SPRINKLER.

A few weeks ago the Edward Balf Company, street sprinkling contractors, of Hartford, Conn., placed an order with the Electric Vehicle Company for an electric sprinkler. The machine was delivered last week and immediately put into commission. It is pronounced a complete success and has attracted a great deal of attention in daily use on Hartford's principal thoroughfares.

In general style the sprinkler resembles the ordinary build of horse-drawn sprinkler. The iron water tank is of the usual boiler pattern and has a capacity of 600 gallons. This tank is mounted on a medium-weight truck chassis, power being derived from an underslung Exide battery of 44 cells. There are two motors, normally rated at from eight to ten horse-power, and the normal speed is six miles per hour.

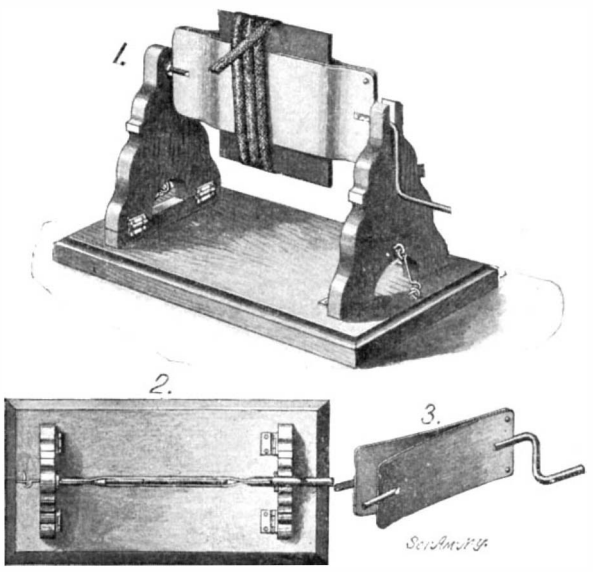
The machine covers from 30 to 40 miles daily in actual use, or about twice the mileage of a two-horse sprinkler with one change of horses; in other words, the machine does double the work of four horses.

As this is the first attempt to substitute automobiles for horses in street sprinkling, the outcome of the experiment will be watched with a great deal of interest. From present indications it will be thoroughly successful. One obvious advantage is that at times when the sprinkler cannot be used on account of the season of wet weather, the owner is not obliged to maintain horses in idleness. The maintenance of the storage battery should cost but little in the present case, as the service it has to perform is light.

Patent Department

APPARATUS FOR WINDING BRAID, LACE, ETC., ON CARDS.

The winding apparatus illustrated in the accompanying engraving should prove useful in retail dry-goods stores and like places, for winding up braids, laces, veilings, and similar goods onto stiff cards or boards. It comprises a pair of standards hinged to a

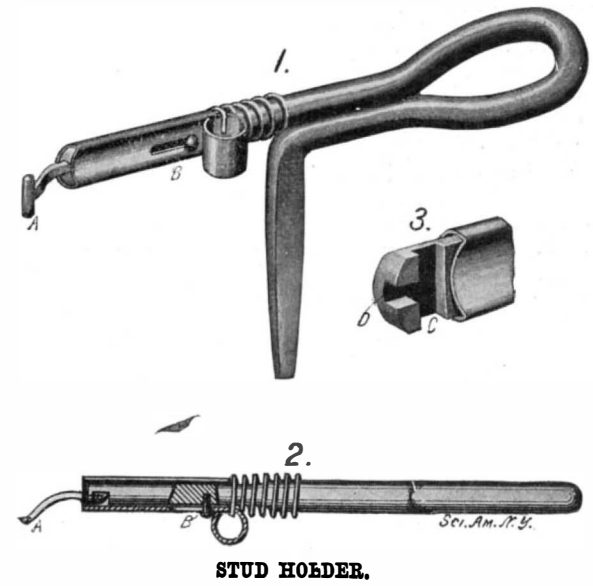


APPARATUS FOR WINDING BRAID, ETC., ON CARDS.

suitable base, and forming supports for the winding reel. The reel consists of two thin metallic clamping plates, riveted together at one end. This end carries a trunnion, terminating in a crank arm, and adapted to drop into a slot in the top of one of the standards. The trunnion, at the other end, is made in two parts fastened to the free ends of the spring plates, and the two parts together engage a closed bearing in the other standard. In use the card or board on which the material is to be wound is inserted between the plates, which are thereupon sprung together and mounted in their bearings, thus firmly clamping the card in place. The winding can then be conveniently and speedily done by turning the crank handle. When the winding operation is completed, it is only necessary to lift the reel out of its bearings, and then the card with the material wound on it can be drawn off the spring plates. As these plates are very thin, they do not interfere to any extent with the tight winding of the material on the card. When not in use the device can be conveniently folded, and stored away in a comparatively small space. Mr. E. C. Naylor, of Gloversville, N. Y., has recently been granted a patent on this winding apparatus.

IMPROVED BELT-STUD TOOL.

A patent has just been granted to Mr. John Stocker, of Muscatine, Iowa, on an improved tool for applying belt-studs, especially those of the Blake variety. Heretofore tools had been designed for a similar purpose, but they have usually been in the form of nippers, and have always been so arranged that it is necessary to grip the handle, or some other part, in order to retain the stud in the tool, and when the tool was laid down for any purpose, the stud would drop out. It was also necessary to use a separate awl for spreading the belt holes in order to apply the stud. In Mr. Stocker's tool the stud is retained without any attention on the part of the user, and at a convenient point on the implement an awl is formed. The holding de-



STUD HOLDER.

vice, as shown best in Fig. 3, consists of a T-slot, *C D*, cut in the end of the rod, which forms the body of the tool. In this slot a stud, *A*, is laid, and a sleeve on the rod is then moved over it to prevent it from slipping out. This sleeve is normally held in this position by a compression spring, and a handle is formed at one end of the sleeve, whereby it may be drawn back to remove the stud or insert a new one. A screw, *B*, threaded into the handle, and passing through a slot in the sleeve, serves to retain the latter. The handle of the implement is formed by bending the rod in a loop, and an extension which turns at right angles to the rest of the tool is flattened to serve as an awl. It will be observed that the stud is securely held in position, ready to be inserted at any time, and that if the tool is laid aside or used for the purpose of enlarging the belt holes, there will be no danger of the stud dropping out.

IMPROVED SHELL-DIGGER.

A new type of shell-digger has just been patented, which can be much more conveniently operated than the common, double-handled type now in use. The implement is adapted for digging shell-fish of all kinds, but particularly pearl-bearing clams or mussels. As shown in the accompanying engraving, the improved shell-digger has but one handle bar, and the scoops or rakes are opened and closed by operating a lever at the upper end of the bar. The operating lever is connected by a link to a rod that passes down through the center bore of the handle bar, and engages a tubular shank, which is fitted to slide in the

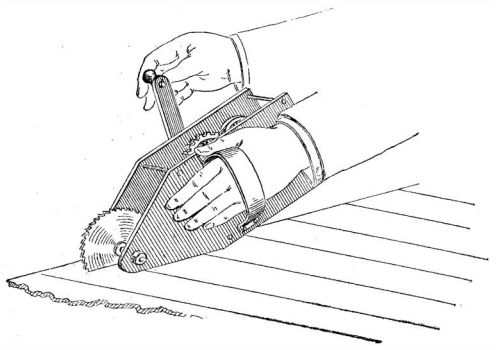
OYSTER DREDGE.

lower end of the bar. This shank carries a yoke plate, to which the inner ends of a pair of angle levers are connected. At their outer ends the levers carry the scoops, which are of the usual type. These angle levers are fulcrumed to pairs of link bars, depending from the bottom of the handle bar to which they are attached. In use the operating lever is first lowered, depressing the inner ends of the angle levers, and causing the rakes to spread open. Then the lever is pumped up and down a few times, to drive the prongs of the rakes into the sand or mud. When the prongs are properly embedded in the bottom of the watercourse, the operating lever is raised, closing the rakes. A spring catch at the bottom of the handle bar then slips over the yoke plate, locking the rakes in closed position, which permits the device to be raised from the water without disturbing its contents. The implement is so designed that it may be readily taken apart for repairs when necessary. The inventor of this shell-digger is Mr. William McCoy, of New Harmony, Ind. (care of Mr. William Du Hamel).

The United States Patent Office will issue a list of classified inventions on July 1. Such volumes are issued at intervals of three or four years, and the last one was in 1901. The task of getting together the data for such a list is now a monumental one, on account of the vastly-increased work of this department. During the month of December last, the Commissioner of Patents announced his intention to have this work done, and the examiners were given from January 3 to February 6 in which to prepare the reports of their respective divisions.

ODDITIES IN INVENTIONS.

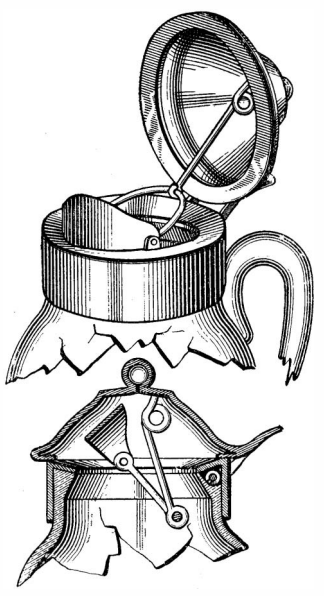
SHINGLE CUTTER.—A very neat little machine has been invented by Mr. Mathias Knapp, of Enid, Oklahoma Ty., for trimming or cutting the course of shingles on the comb of a roof. The device consists of a circular saw, which is manually-driven through step-up gearing. The gearing is held between two side plates, the forward ends of which are tapered to such an angle that when they are rested on the roof, the



SHINGLE CUTTER.

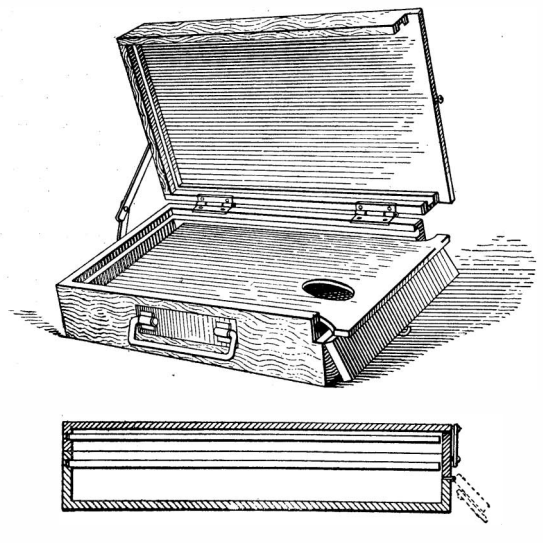
saw will be held in the right position to cut the shingles. For convenience in handling the machine, a strap is attached to one side, through which the left hand is passed, while the right hand operates the crank handle. It is claimed that the device will do its work very rapidly and efficiently. One important advantage of the construction is that the saw is fed forward, enabling the operator to better guide it along a given line.

SYRUP PITCHER.—A Texan inventor has devised a rather novel syrup pitcher, designed to release the overflow of the syrup, and permit it to flow back into the pitcher. Most syrup pitchers are provided with an inner lip, at the base of which there is a channel to catch the overflow or drip. No provision, however, is made for returning this drip to the pitcher. In the present instance the lip is hinged to the pitcher, and connected by links to the lid in such manner that when it is closed the lip is swung up out of its seat, as shown in the section view, and the drip is then free to flow back into the pitcher.



SYRUP PITCHER.

ARTIST'S SKETCH BOX.—Pictured in the accompanying engraving is a very convenient sketch box, recently patented by a New York inventor. The box is arranged to safely hold the stretched canvas and the palette, also pastels, or such other materials as an artist may desire to carry with him. At one end the cover of the box and the upper part of the body portion are open, and grooves are cut in the former to receive the stretched canvas, while the palette is supported in grooves in the body of the box. Thus they are spaced apart, and there is no danger of injuring the painting while the box is being carried. Below the palette there are several compartments for different materials, and these should preferably be covered with a cloth, to keep them from contact with the palette. A hinged section covers the ends of the grooves when the box is closed, and by means of a hook thereon, the cover and body portion are locked together.



ARTIST'S SKETCH BOX.

RECENTLY PATENTED INVENTIONS.

Electrical Devices.

MULTIPLE-HOOD INSULATOR.—L. Steinberger, New York, N. Y. This invention relates to insulators for supporting electrical conductors, Mr. Steinberger's more particular object being to produce a neat, cheap, efficient, and reliable insulator of composite character and which may be taken apart and put together at will. For insulating material employed in making the hood the inventor prefers a substance known under the trade-name of "electrose."

STRAIN.—L. Steinberger, New York, N. Y. The present improvement has reference to strains of the kind employed in connection with wiring, and admits of general use for all purposes in which a strain is generally employed. The strain possesses extraordinary tensile strength, which may be combined with the most absolute certainty of insulation.

ILLUMINATING DEVICE.—C. F. Alline, Fort Dodge, Iowa. In the present patent the invention has for its object the provision of a new and improved illuminating device for use in show-windows and other places and arranged to attract the attention of passers-by and other persons. The device is very simple and durable in construction and can be cheaply manufactured.

Of Interest to Farmers.

WIRE-STRETCHER. — C. F. Hofeldt, Lloyd, Mont. The invention relates to improvements in devices for stretching and repairing wires of wire-fences, the object being to provide a wire-stretcher of simple and novel construction and by means of which a wire may be tightly drawn with comparatively little manual exertion. If the first stretching is not sufficient, the wire may be clamped in the middle clamp or with the clamp attached to the post and the frame again opened and operated.

HOG-RINGING IMPLEMENT.—J. Gould, Sr., Clinton, Pa. In this instance the invention refers to mechanical means for inserting and securing a ring in the snout of a hog to prevent the beast from rooting soil, and has for its object to provide novel features of construction for a hog-ringing implement that are simple, practical, and easily operated, and which adapt the tool to automatically close the ring in the rim of the snout when applied thereto.

PLOW-POINT.—H. N. Berry, Meridian, Miss. The invention is an improvement in points for plows, and especially for use on plow-stocks, having longitudinal slots or openings extending from front to rear. It provides a thin, long point which may be applied over worn-out plows or sweeps and is made adjustable along its securing-bolt and is also provided at its upper end with a rearwardly-extending tongue operating in the slot of a plow-stock and preventing any turning movement of the point-blade on its securing-bolt.

Of General Interest.

SMELTING-FURNACE.—P. Healey, Campbird, Col. This invention uses neither water nor air alone, but a mixture of the two in the form of an atomized spray, which mixture of air and spray secures a much better cooling effect, and which spray after having become converted into steam by the absorbed heat is discharged through the twyers into the stack to promote a more rapid combustion and generate a more intense heat.

ROAD-SMOOTHER.—J. Force, Craig, Neb. In this instance the principal object is to provide a device with means whereby it may be adjusted to furnish any desired angle between the parts, so that the road can be scraped on both sides of the grade, no matter at what angle the grade may be run from the center.

APPARATUS FOR MARKING SUNKEN VESSELS.—F. W. Johnson, Dawson, Canada. The apparatus comprises a buoy connected with a vessel to rise to the surface as vessel sinks. It has an annular bell and a ball arranged to roll against the bell as the buoy works in seaway, the ball being confined until buoy is water-borne. The buoy is connected with a vault arranged with a reel on which the line is wound, and having compartments for storage of ship's valuables. This vault is connected to vessel by means of a line for which a second reel is provided. Should vessel sink the buoy rises to surface. Doing so releases the ball, the bell continually sounding. By hauling up on buoy-line the vault rises to surface, and ship's position marked by second line, which connects vault with the hulk.

CORSET.—E. Savoye, 35 Rue du Caire, Paris, France. This improvement comprises a corset, each half comprising a breast part having one edge concaved and the other convexed, a waist part having one edge concaved and the other convexed for a portion of the length and terminating in a straight line, and an abdominal part having its lower edge convexed and terminating in outward curves, the upper edge of said part being formed with a curved and straight line. This corset affords an agreeable appearance by means of the seam-lines alone and comfort in wearing, because the lines can be reduced to very small number, say two—none intersecting vertically the waist.

BEARING FOR HANDLE-CAPS.—L. B. Prahar, New York, N. Y. The purpose of the inventor is to provide a bearing for the caps employed in connection with the handles of bags, the bearings being so shaped that they may not only be conveniently and readily secured to the bag frame, but are also so constructed that they may be quickly and readily tightened around the cap, even after the bearings have been secured to the frame.

MIRROR-FRAME.—L. B. Prahar, New York, N. Y. The present invention provides an improvement upon the construction shown in a former patent granted to Mr. Prahar for a similar article, wherein the frame is made in two pieces, which necessitates complete new dies each time the design on the handle is changed. In the new construction the frame is made in three parts, a back section in one piece, including a closed body member and handle member, and a front section consisting of a bezel and front handle member in independent pieces, rendering it possible with change of design in front handle member or bezel to provide but a single new die for the member to be changed.

KEYBOARD.—M. H. Odell, Cincinnati, Ohio. The object of this inventor is to provide a keyboard, in which the keys are not liable to stick on account of the tightening of the bushing on the balance and guide pins caused by the swelling of the wood carrying the bushing and at the same time allowing the use of any kind of fall-board, as all cross-rails, key-binders, and like devices are entirely dispensed with.

REINFORCE.—J. F. Francia, Paris, France. The object of the present invention is the provision of a reinforce for sticks, poles, masts, and other articles made of wood or like materials and arranged to give great strength and rigidity to withstand heavy strains without danger of breaking or impairing the wooden core or the shape or strength of the article and to allow of conveniently securing the ends of the reinforcing-strips to the ends of the wooden core without danger of weakening either the strips or core. The invention relates to reinforces such as shown and described in the Letters Patent of the United States formerly granted to Mr. Francia.

THEATER APPLIANCE.—A. M. Anderson, Moorhead, Minn. Upon the discovery of fire the means provided will cause the screw-shaft to operate in a nut and carry the stage, with all parts attached thereto, back through an opening in the rear. The partition and all parts in front of the stage will remain stationary. In its movement backward the stage through the instrumentality of a flexible connection will pull down the fire-shield, and the asbestos curtain should go down with it or before it in order that the audience may not see that anything unusual has happened. The stage may move rearwardly a distance equal to the height of the fire-shield.

EXERCISING APPARATUS.—G. H. Pfund, San Francisco, Cal. The physical-culture apparatus is more especially designed for straightening the back and expanding the chest. By its use any deviation of the spinal column can be readily prevented or cured, whether forward or sidewise. The use also tends to make the lungs and heart strong, and at the same time tends to increase the beauty of the exterior body. The apparatus has been adopted in a number of colleges.

FISHING-REEL BRAKE.—J. A. MacMahon, New York, N. Y. The aim of the improvement is to provide a brake arranged to allow freedom of movement of the spool when the line is run out, to prevent backlash, and to permit the fisherman to give any desired resistance to the reel with a view to increase or decrease the tension of the line when the fish is hooked or other circumstances require it.

Household Utilities.

CABINET-KITCHEN. — C. F. Parker, Washington Court-House, Ohio. The inventor employs a structure comprising a stationary section and a swinging section applied thereto, the latter adapted to be carried against the first so as to completely inclose all interior parts of the structure. The upper part of the interior of stationary section is of special construction as is the lower part thereof, and mounted in the lower is a revoluble series of specially-constructed receptacles, together with a specially-constructed swinging frame for support of gas or other stove. Upper part of interior of swinging section is also of special construction.

DEVICE FOR MAKING TEA, COFFEE, OR OTHER INFUSIONS.—C. McKenzie, Butte, Mont. The invention pertains to an improvement in devices for making tea, coffee, or other beverages, steeped or boiled, and has for its object to produce a device in which the strength of the infusion can be regulated according to the varying tastes of the users, and still use the same pot and the same amount of tea or coffee or other infusion material in every case.

CURTAIN-FIXTURE.—B. F. Rice, Milford, N. H. The invention has reference to devices for supporting the rolls of window-curtains, and has for its principal objects the provision of a secure fixture which without altering the point of attachment to the casing may be readily adapted to support rolls of different lengths.

DOMESTIC SINK.—J. H. Doyle, New Orleans, La. In the present patent the invention has reference to domestic sinks, basins, and the like, the more particular object of the inventor being the provision of means for flushing the drain-pipe without the necessity of passing water through the sink, basin, or analogous utensil.

SAD-IRON HEATER.—C. M. Best, Lamar, S. C. This improvement is in that class of small portable heaters which comprise a base part adapted to sit upon a stove or to contain fuel for independent heating and a tapered or pyramidal top part, which is attached to such base and against which the irons rest when being heated. It is made in such proportions that it is easily portable, and may be set upon a stove, stove-opening, or other support, as convenience requires. The detachability of the base and top parts and the grate provides for convenient manipulation when the heater is in use and for convenient separation to clean the grate.

Machines and Mechanical Devices.

VENDING-MACHINE.—T. B. Erwin and H. C. Meyer, Britt, Iowa. The invention is embodied in a machine for vending cigars from a box or other receptacle in which the cigars are packed in separate holders, which are attached at intervals of equal length to a flexible web or strip, preferably of paper. The construction makes it impossible for persons to obtain articles from the machine by fraudulent means. The improvement may be embodied in machines for vending other articles.

APPARATUS FOR TRANSFORMING MOTION.—P. E. M. Bastiou, Hotel de Couquedec, Lannion, Côtes-du-Nord, France. Dr. Bastiou's device consists essentially of a lever of special arrangement, at one end of the extremities of which the force to be transmitted acts, while the other extremity presents two arms, one of which is directed upwardly and the other downwardly and acting upon two ratchet-wheels keyed upon the shaft from which movement is to be transmitted. These two arms drive their respective ratchet-wheels alternately, one in rising and the other in descent and always in the same direction. The form of lever is applicable to many other purposes. For example, employed for transmitting the movement communicated to a shaft by the intermediary of pedals.

Medical Appliances.

DENTAL-ENGINE ATTACHMENT.—J. E. Morgan, Emporia, Kan. The attachment furnishes a continuous blast of air to blow chips from the cavity of a tooth as fast as they are drilled, saving time by not stopping the drill and reducing pain by keeping the drill cool and avoiding heat due to friction. A fan-blower is so constructed as to be mounted on the upper portion of the ordinary dental engine and be operated by same belt which operates the drill and provided with a blast-tube leading to a nozzle mounted on the hand-piece in such proximity to its drill as to properly direct the blast into the cavity of the tooth.

CLINICAL-THERMOMETER CASE.—O. G. Bell and R. C. Stofer, Norwich, N. Y. The object of the invention is to provide a case arranged to protect the glass tube containing the antiseptic solution against breakage and to permit convenient and quick withdrawal of the thermometer from the solution whenever it is desired to use the thermometer for its legitimate purpose.

SYRINGE.—F. Wackenhuth, New York, N. Y. The invention has reference especially to hypodermic syringes, although certain features of the improvement could be readily applied to syringes of other types. Among its advantages it will be found that should the needle break at any time it is only necessary to unscrew the sleeve from the bushing and apply a new needle, and the bushing may be removed at any time for the purpose of cleaning or packing the syringe and also to permit the introduction into the cylinder of the syringe of the medicine to be injected.

SURGICAL APPLIANCE.—A. Breslin and J. Lees, Summithill, Pa. The invention is adapted to be easily applied to the body and worn with ease and comfort without applying undue pressure at any point to prevent rest or sleep. The patient is controlled as to his position so that he cannot roll or turn on his back, abdomen, or side, according as the appliance is arranged. It is useful in cases where strapping-down jackets would not be tolerated, as well as for preventing nightmare and other disturbances which usually occur while sleeping on the left side or back.

Prime Movers and Their Accessories.

SELF-ADJUSTING CYLINDER-RING.—M. J. Kilroy, New York, N. Y. The purpose of this invention is to provide a construction of steam-ring and bull-ring for a cylinder and a connection between the two, whereby the steam ring or rings will be forced by the pressure of the steam to accommodate themselves to any irregularities they may meet in the inner surface of the cylinder, and yet be held against end movement.

EMERGENCY THROTTLE-VALVE. — L. Neumann, Gleiwitz, Prussia, Germany. The invention relates to a valve adapted to close automatically in the event of the pipe in which it is fitted breaking. One advantage of the present valve is that it can be arranged in every horizontal or vertical position and that by means of the lever provided outside the valve-casing it can be easily ascertained whether the valve is in order or not, while the combination of the piston with the valve adapted to close in the direction of the passage of the steam prevents the latter from being operated by small variations in consumption of steam or from being closed with shock likely to injure plant if the pipe breaks.

Pertaining to Vehicles.

BUGGY-TOP BRACE.—P. W. Moyer and D. D. Moyer, Luray, Va. It is a special feature of the invention that the jointed brace is pivoted to the seat-back at a point far enough above the pivotal connection of the top bows with the seat to enable it when top is folded to support the top and hold it rigidly, and not to be raised by jolts or oscillations of wagon-body. Thus the brace is pivoted at one end to top portion of buggy and at the other to top portion of the rear bow. The two braces have the rule-joint, which allows them to yield when top is folded and lowered, which when the jointed brace extends, maintains itself, with parts in rigid alinement, thus bracing the top. The inventors have made another invention of a Buggy-Top Brace, comprising means for supporting a buggy-top when raised, and holding it down when folded. They employ a rock-shaft, arranged horizontally on the back of the seat, and provided at its ends with jointed braces, pivotally connected with the top, and centrally with the lug, upon which a stiff spring is adapted to bear for preventing rotation of shaft when the top is adjusted in either of the positions stated.

Railways and Their Accessories.

CAR-FENDER.—C. H. Turner, New York, N. Y. The object of the invention is to provide a fender of comparatively light yet strong construction that may be constructed at small cost, that may be readily applied to a car without requiring changes in the car structure, and that will easily slide underneath a car upon striking an obstruction other than a person, such as a truck or the like, thus avoiding possible breakage or damage of the fender by meeting such obstruction and preventing essential damage to a vehicle against which it may strike.

RAILWAY FROG AND GUARD-RAIL.—D. J. Swing, Hagan, Ga. Mr. Swing's invention relates to improvements in switch-frogs and guard-rails for railways, the object being to provide a frog connection between main-line rails and siding-rails so arranged that the frog may be swung clear of the main line, thus providing solid or continuous main-line rails at the siding, and making it unnecessary to slacken speed of a train in passing such points on the main line. The frog and guard-rail may be readily attached to railway-lines without disturbing the general construction of the line, and as the frog and guard-rails are preferably made of hardened steel they will wear for a very considerable time.

MEANS FOR FASTENING IN POSITION RAILWAY-SPIKES OR THE LIKE.—G. G. Lakhovsky, 272 Boulevard St. Germain, Paris, France. The present invention has for its object to prevent the working loose and play of spikes or the like in their holes, and chiefly those employed with the wooden sleepers of railway-lines. It relates more particularly to means applied to spikes used for securing broad-footed rails in position with the purpose to afford a seat to the head of the spike and to prevent any inclination of the latter outside the rail.

OBSERVATION-TRAIN.—C. L. Hagen, New York, N. Y. This invention relates to improvements in devices of the character in which a series of passenger-carrying cars or seats are movable along an endless track, a particular feature of the invention being the erection of the same in and around pleasure resorts or parks, so that the passengers may conveniently observe the various attractions.

RECHARGING DEVICE.—J. V. Wells, Braddock, Pa. This invention relates to a device adapted to be used in connection with the triple valves of automatic air-brake systems. It is useful in connection with triple valves of various sorts, but especially with the triple valve forming the subject-matter of Mr. Wells' copending application formerly filed by him. The object is to provide means for retaining the brake-cylinder pressure during the recharging of the auxiliary reservoir in such a manner, however, as will enable the brakes to be quickly and fully released, when the predetermined auxiliary-reservoir pressure has been reached.

STANDARD FOR LOGGING-CARS.—C. H. Allen, Savannah, Ga. The design of this inventor is to provide a standard which is to be arranged on the ends of the transverse bolsters of the car to prevent the logs from rolling off when in transit, but which is capable of adjustment to permit the easy loading or unloading of the logs. The device is equally applicable to cars for handling heavy lumber, iron beams, etc.

NOTE.—Copies of any of these patents will be furnished by Munn & Co. for ten cents each. Please state the name of the patentee, title of the invention, and date of the paper.

Business and Personal Wants.

READ THIS COLUMN CAREFULLY.—You will find inquiries for certain classes of articles numbered in consecutive order. If you manufacture these goods write us at once and we will send you the name and address of the party desiring the information. **In every case it is necessary to give the number of the inquiry.**
MUNN & CO.

Marine Iron Works. Chicago. Catalogue free.

Inquiry No. 6732.—For manufacturers of machines to make compressed medical tablets.

"U. S." Metal Polish. Indianapolis. Samples free.

Inquiry No. 6733.—Wanted, address of firm making Radiora, or radium gold.

Perforated Metals, Harrington & King Perforating Co., Chicago.

Inquiry No. 6734.—For manufacturers of small power pulverizing machines.

Handle & Spoke Mchy. Ober Mfg. Co., 10 Bell St., Chagrin Falls, O.

Inquiry No. 6735.—Wanted, address of maker of spun glass, such as cloth is made from.

Adding, multiplying and dividing machine, all in one. Felt & Tarrant Mfg. Co., Chicago.

Inquiry No. 6736.—For manufacturers of automatic slot machines for mineral water, the same making a specific measure when money is put in slot.

Commercially pure nickel tube, manufactured by The Standard Welding Co., Cleveland, O.

Inquiry No. 6737.—For manufacturers of machines for weaving elastic material such as is used in manufacturing elastic stockings, belts, etc.; also manufacturers of papier maché.

Sawmill machinery and outfits manufactured by the Lane Mfg. Co., Box 13, Montpelier, Vt.

Inquiry No. 6738.—For manufacturers of motors and storage batteries.

The celebrated "Hornsby-Akroyd" Patent Safety Oil Engine is built by the De La Vergne Machine Company, Foot of East 138th Street, New York.

Inquiry No. 6739.—Wanted, a pump, something like a small size boiler feed pump, to be operated by compressed air instead of steam, one that will not waste much air or will return part of the waste back into the boiler again.

Gut strings for Lawn Tennis, Musical Instruments, and other purposes made by P. F. Turner, 46th Street and Packers Avenue, Chicago, Ill.

Inquiry No. 6740.—Wanted, the address of a party to manufacture disks made of fiber in sizes from ⅜ to 1½ for steam valves.

In buying or selling patents money may be saved and time gained by writing Chas. A. Scott, 719 Mutual Life Building, Buffalo, New York.

Inquiry No. 6741.—For manufacturers of slated cloth.

We Manufacture on Contract anything in light Hardware. Write us for estimates. Edmonds-Metzel Mfg. Co., 143-153 South Jefferson Street, Chicago.

Inquiry No. 6742.—For manufacturers of toy balloons.

We manufacture iron and steel forgings, from twenty pounds to twenty-five tons. Crank shafts of all varieties. Erie Forge Company, Erie, Pa.

Inquiry No. 6743.—For manufacturers of crude oil burners for engines and stoves of all kinds.

Have you found a manufacturer for your invention? Write now and send samples. New York Die and Model Works, 508 Pearl Street, New York.

Inquiry No. 6744.—For manufacturers of power transmitting cables such as doctors use in massage treatment.

We manufacture anything in metal. Patented articles, metal stamping, dies, screw mach. work, etc. Metal Novelty Works, 43 Canal Street, Chicago.

Inquiry No. 6745.—For manufacturers of grits, such as are used in window polish; also manufacturers of rouge for coloring brass.

WANTED.—A patented article to manufacture on royalty or to buy outright. Address with full particulars to the W. E. McChristie Co., Camden, Ohio.

Inquiry No. 6746.—For manufacturers of steel-faced iron, such as is used for making planing knives, shoe cutter's dies, etc.

The SCIENTIFIC AMERICAN SUPPLEMENT is publishing a practical series of illustrated articles on experimental electro-chemistry by N. Monroe Hopkins.

Inquiry No. 6747.—For manufacturers of road machines.

General Utilities Company, 299 Broadway, New York, offers unusual facilities for placing inventions and devices of merit before the public. Correspondence invited.

Inquiry No. 6748.—For manufacturer of Columbia dictionary stand or holder.

Perfected kerosene wickless industrial oil burner, adapted for torches, stoves, etc. Large demand. Patent or rights for sale. E. Lyons, 332 Johnson Avenue, Jersey City.

Inquiry No. 6749.—For manufacturers of cotton tie roller for straightening cotton ties.

WANTED.—Colonial silverware. Any one wishing to sell any authentic silver made in this country during the eighteenth century, please communicate with C. A. M., Box 773, New York.

Inquiry No. 6750.—For manufacturers of turbines.

Manufacturers of patent articles, dies, metal stamping, screw machine work, hardware specialties, machinery and tools. Quadriga Manufacturing Company, 18 South Canal Street, Chicago.

Inquiry No. 6751.—For manufacturers of batters' supplies.

You can rent a well equipped private laboratory by day, week or month from Electrical Testing Laboratories. 548 East 80th Street, New York. Absolute privacy. Ask for terms and facilities.

Inquiry No. 6752.—For manufacturers of chemicals, such as those used in explosives.

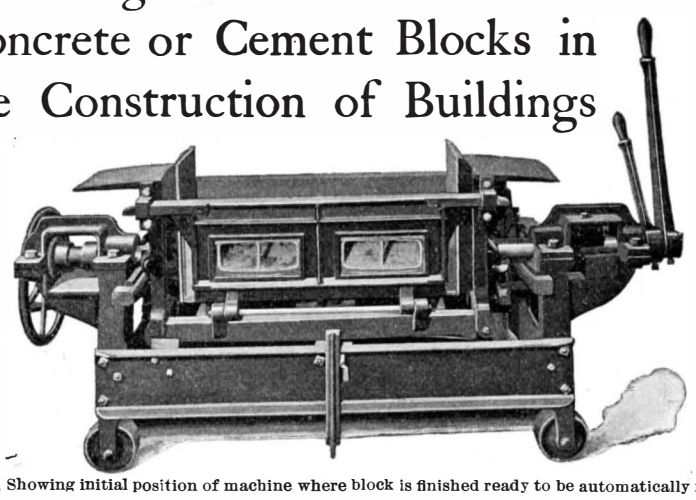
Space with power, heat, light and machinery, if desired, in a large New England manufacturing concern, having more room than is necessary for their business. Address Box No. 407, Providence, R. I.

Inquiry No. 6753.—Wanted, address of manufacturers of sheet aluminum, also aluminum chains.

WANTED.—Bids on plant capable of turning out 100 gross of special pencils per day. For specifications and full particulars address Continental Manufacturing Co., 1155 Broadway, Oakland, Cal., Suite 23.

Inquiry No. 6754.—For manufacturers of Japanned gim tacks of various colors.

The Economy and Advantages Resulting from the Use of Concrete or Cement Blocks in the Construction of Buildings



Cut No. 1, Showing initial position of machine where block is finished ready to be automatically released.

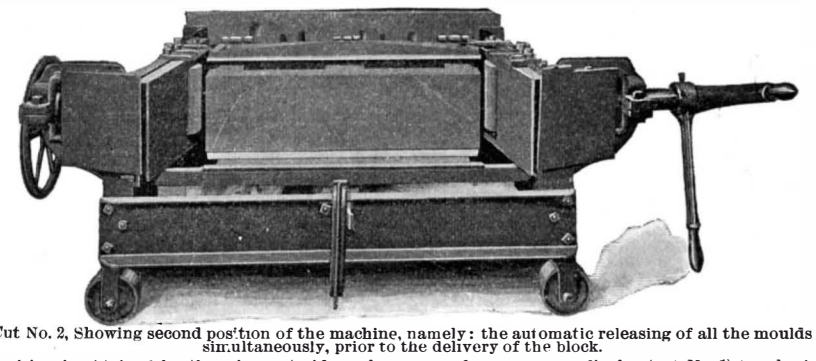
The Concrete and Cement industry is aged, but the Cement Block industry is rapidly taking the place of stone, brick and wood in the construction of all kinds of buildings for the following reasons:

First.—Concrete or cement blocks can be made and laid in a wall for less than the cost of common brick covering the same space.

Second.—Cement Blocks made of the proper proportion, mixture, and quality of sand and cement and properly cured, are stronger, last longer, withstand heat or fire better than the best of natural stone. They also improve with age, where granite, limestone, etc., brick or wood deteriorate with age.

Third.—It is now simply a question of accuracy and rapidity in the manufacture of these blocks, which of course requires a machine well designed, simple, durable to withstand rough usage, perfectly made in all its parts.

Fourth.—The **"Hayden Automatic"** embodies all these features in detail. The **"Hayden Automatic"** is manufactured by a firm that has been in the foundry and machine business for seventy-five years, and has a reputation second to none.



Cut No. 2, Showing second position of the machine, namely: the automatic releasing of all the moulds simultaneously, prior to the delivery of the block.

This position is obtained by throwing out side or long lever from a perpendicular (cut No. 1) to a horizontal position (cut No. 2), and the inside lever is brought from a perpendicular position forward as far as it will go, releasing moulds from block.

Compare the following points of advantage with other machines:

1st. AUTOMATIC.—The Hayden Machine is the ONLY automatic block making machine on the market, for the following reasons:
By one movement of a lever attached to mould-box rock-shaft, all moulds in which block is made are simultaneously opened, releasing the finished block by means of substantial cams, automatically delivers the block from moulds away from machine in a position to be easily carried away for curing, thus saving time and doing away with the awkward and bundlesome method of releasing moulds by hand, and lifting the block from machine at a height that is a strain to the strongest of men. **This is important.**

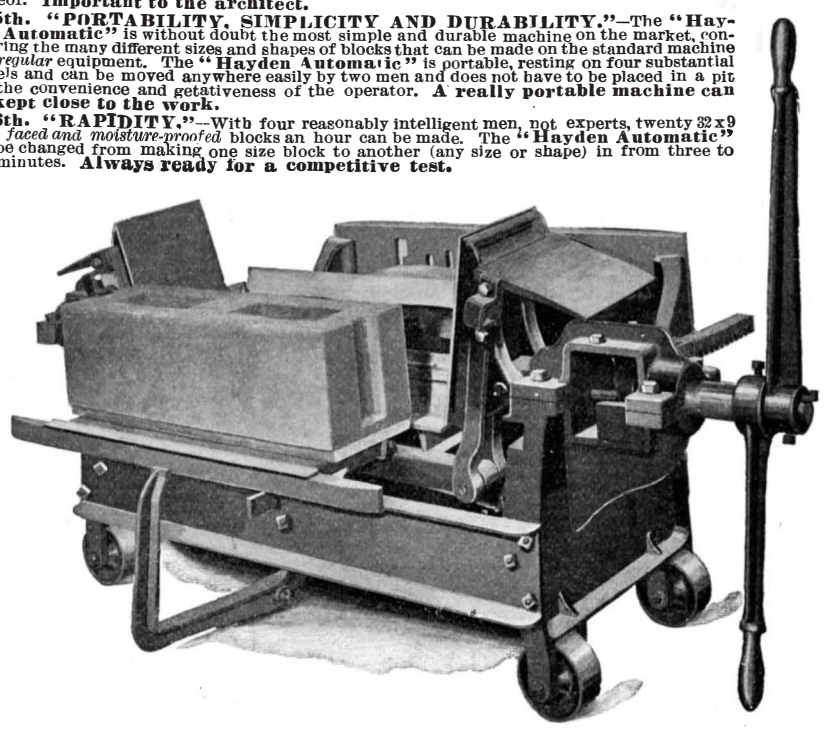
2d. "MOISTURE PROOF FACING."—The face of the block, made on the **"Hayden Automatic,"** is made down, and in a horizontal position, thus enabling the operator to work to much better advantage, produce a perfectly faced block, and more compact for the reason that a large face tamping iron is used, thereby reproducing accurately any design acquired, with sharp corners and edges, facilitating different coloring of the facing, which is made with a mixture of two parts finer sand and one part cement, giving absolute resistance to dampness and frost without any appreciable additional cost in the making of the block. It may be well to add that the same case applies to side opposite face or inside of wall. **Can others do this?**

3d. "STRIKING OFF AND LAYING OF BLOCKS."—Blocks made on the **"Hayden Automatic"** being made face down, enable the operator to strike off on side opposite face or inside of wall, thereby not requiring great care in the striking off of block by the operator, thus saving time and expert labor, as all the laying sides of blocks made on the **"Hayden Automatic"** are accurately moulded in the machine. **This saves money.**

4th. "MEASUREMENTS AND MORTAR ALLOWANCE."—The standard block made on the **"Hayden Automatic"** is 32 inches in length by 9 inches face, but by actual measurement they are 31¾ inches in length by 8¾ inches face, allowing ¼ inch for mortar in laying. This is the only machine on the market with this allowance. The width of blocks (thickness of wall) in standard machine are made in 8, 9, 10, 12 and 16 inch sizes, any other size on receipt of specification. Blocks may be made up to 32 inches in length or any fraction thereof. **Important to the architect.**

5th. "PORTABILITY, SIMPLICITY AND DURABILITY."—The **"Hayden Automatic"** is without doubt the most simple and durable machine on the market, considering the many different sizes and shapes of blocks that can be made on the standard machine and *regular* equipment. The **"Hayden Automatic"** is portable, resting on four substantial wheels and can be moved anywhere easily by two men and does not have to be placed in a pit for the convenience and getativeness of the operator. **A really portable machine can be kept close to the work.**

6th. "RAPIDITY."—With four reasonably intelligent men, not experts, twenty 32x9 inch *faced and moisture-proofed* blocks an hour can be made. The **"Hayden Automatic"** can be changed from making one size block to another (any size or shape) in from three to five minutes. **Always ready for a competitive test.**



Cut No. 3—The final position of machine, showing Block automatically delivered, away from the moulds, in a position to be carried away for "curing." This position is the result of throwing outside or long lever back to its original (perpendicular) position.

All inquiries and information regarding the **"Hayden Automatic"** will be gladly given upon request, and we are always pleased to demonstrate and invite the inspection of anyone interested in a thoroughly up-to-date and automatic cement block machine.

HAYDEN AUTOMATIC & EQUIPMENT CO., 26 Cortlandt St., New York, U. S. A.
Eastern and Foreign Office
THE HAYDEN AUTOMATIC BLOCK MACHINE CO., Columbus, Ohio, U. S. A.
Factory and Western Office

Business and Personal Wants.
(CONTINUED.)

WANTED.—Representative to sell our spinning, weaving and batting machinery, by oldest firm in France and Germany. Grand prize awarded Paris Exposition. Address Steeg, 563 William Street, Buffalo.

Inquiry No. 6755.—Wanted, name and address of inventor of a new material named Kryptol used to produce high temperatures.

All Manufacturers Take Notice!—Patent rights for sale with royalty. Easiest of terms. Improved bicycle—more than three times the power of common bicycle. Attachment can be used on any Bicycle. See cut in Nov. 5th's issue. Use larger saddle. A. A. Kennedy, No. 1233 N. 19th Street, Camden, N. J.

Inquiry No. 6756.—For manufacturers of gate valve boxes (cast iron) used in city streets.

Splendid opening for a high-grade mechanical engineer, who has had a broad experience in managing machine shops, the manufacture of machinery, engines and metal specialties. Applicants must be in prime of life and now employed. Preference will be given to applicants who have had modern scientific training in mechanical schools of high standing. Unqualified references will be exacted. All communications received will be regarded as strictly confidential. Address
Mechanical Engineer, Box 773, New York.

Inquiry No. 6757.—For machinery for producing sheet steel corrugated elbows.

Models, dies, boxes, metal stampings, patent articles, novelties, manufactured and sold. Printing on aluminum. U. S. Novelty Co., Lily Dale, N. Y.

Inquiry No. 6758.—For manufacturers of lumber tramways and cableways for timber.

Engineer having first-class Chicago office desires to represent manufacturers. Address Representative, Box 773, N. Y.

Inquiry No. 6759.—For manufacturers of presses for molding popcorn.

WANTED.—An engineer experienced in the design, construction and use of gasoline motors for automobiles. Address J. F., Box 773, New York.

Inquiry No. 6760.—For addresses of shingle and saw mills.

WANTED.—Second-hand 10-inch Screw-Cutting Lathe. Fred Unser, Mineola, L. I.

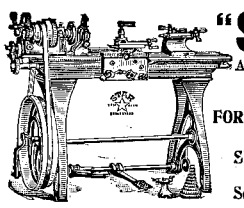
HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters or no attention will be paid thereto. This is for our information and not for publication.
References to former articles or answers should give date of paper and page or number of question.
Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all either by letter or in this department, each must take his turn.
Buyers wishing to purchase any article not advertised in our columns will be furnished with addresses of houses manufacturing or carrying the same.
Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.
Scientific American Supplements referred to may be had at the office. Price 10 cents each.
Books referred to promptly supplied on receipt of price.
Minerals sent for examination should be distinctly marked or labeled.

(9618) J. M. C. says: I am making an armature core, and after cutting out about one hundred disks, I thought that may be the iron (?) I am using is not free from steel. I send you three pieces. Examine them, and write me as soon as possible if they are all right. I have an equal number of all three grades cut. No one here can give me a decided answer as to their being strictly iron. Would it make so much difference if there was a little steel in them? The three are all species I can find here except tin. Is tin good for disks? A. Any one of the three pieces of sheet steel you send will answer for the armature core of a dynamo. The piece marked 3 is thinner and softer than the others and will be better, since more disks can be got into the same space. You cannot get sheet iron nowadays very easily. Steel has crowded it out of the market. As you may know, steel differs from iron in having a small per cent of carbon in it. It is iron with carbon, not a different substance.

(9619) J. H. M. asks: What is the real explanation for the fact that snakes, frogs, etc., are unable to exist on the "Emerald Isle"? Did they ever? A. The insular position of Ireland has doubtless protected it from the incursions of many pests, and among them the ones you specify. Perhaps if they were introduced they would overrun the land, as the Colorado beetle did our States a short time ago. It is a well-known fact that an island often has a flora and fauna peculiar to itself in many respects.

(9620) J. S. asks: If you shoot a bullet through a board with such force that it comes out the other side, which gets through the board first—the bullet or the hole that the bullet makes? I say that it is the bullet. Will you be so kind as to decide the question? A. If by "gets through the board" in this question is meant "entirely" through the board, then the hole gets through first, since the bullet is not entirely through the board until it has traveled its length after the hole is through the board. Its rear end must be clear of the hole before it is through the board. The hole is through the board when the tip of the bullet is seen at the surface of the board on its path through. If the phrase means that the bullet is through when its tip pierces the surface of the board, then hole and bullet come through the board at the same time.



"Star" Foot and Power Screw Cutting Automatic Cross Feed Lathes

FOR FINE, ACCURATE WORK

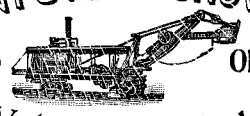
Send for Catalogue B.

SENECA FALLS MFG. CO.
695 Water Street,
Seneca Falls, N.Y., U. S. A.

ENGINE & FOOT LATHES. MACHINE SHOP OUTFITS. TOOLS AND SUPPLIES. CATALOGUE FREE. SEBASTIAN LATHE CO. 120 CULVERT ST. CINCINNATI, O.

Foot and Power and Turret Lathes, Planers, Shapers, and Drill Presses.
SHEPARD LATHE CO., 133 W. 2d St. Cincinnati, O.

GIANT STEAM SHOVELS



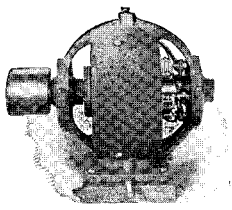
Toledo Ohio, U.S.A.

The Vulcan Iron Works Co.

THE NICKEL PLATE ROAD BETWEEN NEW YORK AND BOSTON, AND CLEVELAND, FT. WAYNE AND CHICAGO

Lowest rates and elegant equipment makes this a favorite route between the above points. Through sleepers. Unexcelled dining car service. Individual club meals 35 cents to $1.00 each. Also a la Carte. Full information on application to R. E. Payne, General Agent, 291 Main St., Buffalo, N. Y., or A. W. Ecclestone, D. P. A., 385 Broadway, New York City.

8 LIGHT DYNAMO $26.50

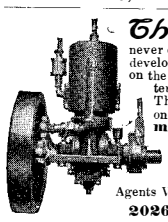


Other sizes 3 to 300 Lamps

MOTORS

from 1-16 to 20 H. P.
Write for Bulletin

ROTH BROS. & CO.
27 S. Clinton St., Chicago



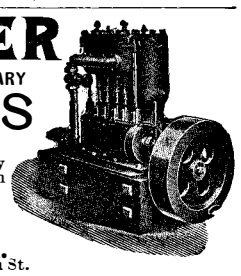
The Cushman Motor never disappoints. The least weight for the power developed makes it the Best Boat and Auto Motor on the market. The New 1905 Model is better than ever. The engine proper is valveless. The cylinder, water jacket and head are cast in one piece. It is the simplest as well as the most efficient. Holds many speed records. Made in Single and Double Cylinder patterns. Prices make it economical. Cut shows 2 h. p. marine, weight 75 lbs. We make Auto Motors and Stationary Engines. Catalog free

Agents Wanted. CUSHMAN MOTOR CO.
2026 N Street, Lincoln, Neb., U. S. A.

PALMER

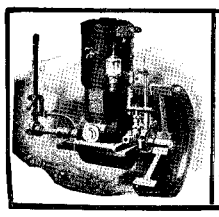
MARINE and STATIONARY MOTORS

2 and 4 CYCLE



are no experiment, as they are in successful operation in all parts of the world.
Launches in stock.
Send for Catalogue.

PALMER BROS.,
Cos Cob, Conn.
New York Office, 34 W. 26th St.

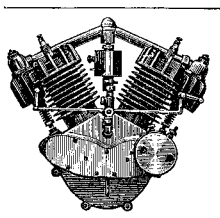


Hydro-Carbon Motors

Headless Self-Contained

It is as easily controlled as a steam engine. Variable sparker. The only perfect moderate priced launch engine on the market. Let us convince you. Write to-day.

Grant-Ferris Co., Troy, N. Y.



THE CURTIS DOUBLE CYLINDER MOTOR

5 h.-p. 60 lbs. Roller Bearings.

Capt. Baldwin's famous airship, the California Arrow, is propelled by this motor. Also our motorcycle, which holds the world's record of 10 miles in 8 min. 54 2-5 sec.
Catalog Free.

G. H. CURTIS MFG. CO.
Hammondsport, N. Y.

The WONDER ALTERNATOR

SOMETHING NEW

Just what you've been looking for

Only small combined alternating and direct current generator manufactured. The most interesting and useful piece of electrical apparatus ever offered. Can also be operated efficiently as a motor. Wound for any voltage up to 10. Weight 4½ lbs. Send for descriptive circulars. Agents wanted.

THE R. M. CORNWELL CO.
406 S. Salina St., Syracuse, N. Y.

How To Increase Your Business

READ carefully, every week, the **Business and Personal Wants** column in the

Scientific American

This week it will be found on page 329.

Some week you will be likely to find an inquiry for something that you manufacture or deal in. A prompt reply may bring an order.

Watch it Carefully

(9621) C. S. W. asks: It takes several years for light from the sun to reach the earth; the light we now see started from the sun years ago. If the sun's light were extinguished, would we continue to get sunlight for as long a time as it takes the light to reach the earth? On this theory, does an eclipse occur at the time we see it, or is it only the result that we see several years after the eclipse takes place? A. It requires 499 seconds for the light to come from the sun to the earth, and about one and one-third seconds to come from the moon to us. Hence, if the moon intercepts the light of the sun, we see the fact in one and one-third seconds after it happens. Whatever occurs on a distant star to affect its light, we see at such a time after it occurs as may be required for the light to pass over the space between us and that star. Anything that occurs on the sun is seen by us 8 minutes and 19 seconds after it occurs.

(9622) M. J. McC. asks: Does the part of a wagon wheel touching the ground while in motion stop while the other part of the outer rim of wheel revolves, or do all parts of the outer rim revolve at the same velocity? I have heard this argued, but I confess I can't see how one part of the wheel could be in motion while the other was stationary. A. The part of the rim of a wagon wheel which is in contact with the ground is at rest while the rest of the wheel moves along in the direction in which the wagon is traveling, and the whole wheel moves around a line drawn through the center of the axle. Both statements are facts. We might add to this curiosity of motion that the top of the rim of the wheel moves forward in the direction in which the wagon is going twice as fast as the hub of the wheel moves. To understand the matter it is necessary to distinguish kinds of motion. The wheel has two certainly. It moves with a rolling motion over the earth; it rotates on its axle. Its motion of rotation as viewed by a fly which might be standing on one of the spokes is a continuous motion round and round, always repeating itself. The motion along the ground is of another kind. If a fly stood on the ground as the wheel passed by him, he would see a point of the rim come down to his side and stop. It would immediately begin to rise, and would go up high in the air only to descend again, and so on again and again. A point of a wheel in contact with the earth is not in motion with reference to the point of the earth on which it is pressing unless it is slipping backward, a condition which this case does not include. It is at rest therefore on the ground, but in motion around its hub or axle. Rest and motion are frequently relative. To some point a body may be at rest. To some other point it may be in motion. And it is sometimes quite puzzling to determine the rest and motion as it may be in reality. This is the case with some of the motions of the heavenly bodies. The motion of a wheel may be tested by taking a small circular disk and fastening a chalk crayon in a hole close to its edge. Then roll it along a fence in such a way that the chalk will mark a line on the boards. You will be interested in seeing its real path. You will see that it contains a point of rest. The curve traced by the crayon is called a cycloid.

INDEX OF INVENTIONS

For which Letters Patent of the United States were Issued for the Week Ending April 11, 1905

AND EACH BEARING THAT DATE

[See note at end of list about copies of these patents.]

Adding machine, A. J. Postans	786,839
Advertising device, W. B. Hopkins	787,178
Air brake, Geltz & Hosack	787,329
Air compressor, hydraulic, W. G. Cox	787,150
Air ship, E. F. Wood	786,932
Anchor, J. W. Witmer	787,017
Animal trap, T. Bumann	786,949
Armor plate, F. G. White	787,065
Automobile, E. T. McKaig	786,916
Awning, W. L. Bundy	787,146
Axle box, car, W. F. Richards	786,993, 786,994
Axle lubricator, J. Aden	787,255
Bag fastening, P. Rudisch	787,000
Bag frame, A. F. Fuller	787,165
Bag or the like, O. Greenbaum	786,804
Baling press, W. S. Bradshaw	786,948
Baling press, E. H. Taylor	787,008
Baling press, D. E. Darnell	787,082
Baling press, Kruse & Vanderwerth	787,194
Baling press, L. Trabue	787,235
Baling press feeder and packer, G. Christopher	786,873
Barrel, knockdown, W. E. Copithorn	786,875
Basin, W. Mattingly	787,202
Batteries, means for controlling the charging of storage, R. N. Chamberlain	787,024
Beating engine, J. E. Warren	787,063
Bedstead, invalid, W. C. Feely	787,162
Bicycles, etc., resilient handle bar for, M. Thierfelder	786,857
Bilge block, J. Hickler	787,294
Bit. See Drill bit.	
Blanket pin, S. Galloway	787,286
Blinder, E. Diedrich	786,878
Blower, steam jet, C. T. Coe	787,279
Boiler fire tube, steam, P. H. Seery	786,847
Boiler headers, apparatus for making serpentine, R. A. Barrett	786,794
Boll weevil exterminator, A. B. Carter	787,276
Bookcase, knockdown sectional, H. M. Amsden	786,940
Book hand rest, note, C. Arnold	787,140
Bottle, T. W. Russell	787,309
Bottle, non-refillable, G. T. Kenly	787,188
Bottle stopper, water, Schweinert & Kraft	787,118
Bottle storing case, J. J. Koons	787,300
Bottle washing machine, C. W. Desobry	786,877
Box-making machine, W. Corkhill	786,956
Brake, F. Davignon	787,151
Brake mechanism, N. T. Harrington	786,807
Brake shoe, F. P. Collier	787,079

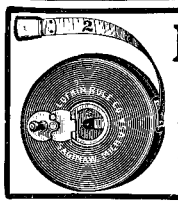
The Improved Method of FINISHING FLOORS

Filling Cracks with Grippin's Filler and Patent Applier

old or new, for rugs or otherwise, with Grippin's Wood Crack and Crevice Filler and Finishing Specialties, is very simple and economical, not requiring skilled labor though the highest degree of perfection is attained. We give full instructions for treating all surfaces. Write to-day for our descriptive matter to

GRIPPIN MFG. CO.
Dept. 6
Newark New York

THE ELECTRICAL AGE
25 Cents a Copy
The Best Electrical Paper Published
THE ELECTRICAL AGE
3 West 29th Street, New York

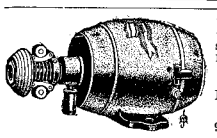


LUFKIN TAPES AND RULES

ARE THE BEST.

For sale everywhere. Send for Catalog No. 16.

LUFKIN RULE CO.
Saginaw, Mich., U. S. A.
New York and London.



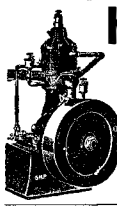
Every Gas Engine User should learn about the Apple Automatic Sparker. Easily attached. No more belt, battery or commutator troubles. Increases power and speeds For any kind of ignition apparatus write

The Dayton Electrical Mfg. Co.
98 Beaver Bldg. Dayton, Ohio.

BUFF

TRANSITS AND LEVEL are used exclusively on the largest works where utmost precision is required. Send for new catalog No. 22.

THE BUFF & BUFF CO.
Boston, Mass.



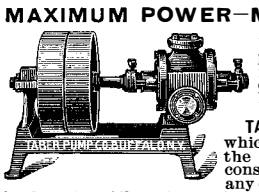
Kerosene Oil Engine

Nothing but Kerosene Oil to run it

Simple, Safe and Efficient. Needs little attention, is less likely to get out of order, and is cheaper to run than any other engine manufactured. Economical and Easily Operated

International Power Vehicle Co.
Stamford, Conn.

MAXIMUM POWER—MINIMUM COST

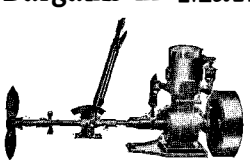


If you use a pump for beer, lard, acids, starch, petroleum, brewer's mash, tanner's liquor, cottonseed oil or fluids, hot or cold, thick or thin you want to get the TABER ROTARY PUMP which does the most work at the least expense. Simply constructed. Can be run at any desired speed. Perfectly durable. All parts are interchangeable. Needs no skilled workman. Defects guaranteed. *Catalogue free.*

TABER PUMP CO., 32 Wells St., Buffalo, N. Y., U. S. A.

STEAM TURBINES.—THEIR CONSTRUCTION, Operation and Commercial Application. SCIENTIFIC AMERICAN SUPPLEMENTS **1306, 1307, 1308, 1422, 1400, 1447, 1370, 1372.** The articles have all been prepared by experts in steam engineering. Price 10 cents each, by mail. Munn & Co., 361 Broadway, New York City, and all newsdealers.

Bargains in Marine Engines



1 H. P., $90.00
2 H. P., 111.00
3 H. P., 132.00
4 H. P., 156.00

Engine complete with *everything* ready to run. Write us at once.

Michigan Motor Co.
Grand Rapids, Mich., U.S.A.

If You Want the Best Lathe and Drill CHUCKS

BUY WESTCOTT'S *Strongest Grip, Greatest Capacity and Durability, Cheap and Accurate.*

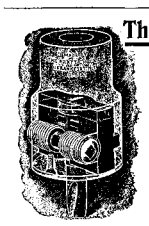
Westcott Chuck Co., Oneida, N. Y., U. S. A.
Ask for catalogue in English, French, Spanish or German.
First Prize at Columbian Exposition, 1893.

Mark Your Tools

Here is a Marking Outfit with which tools of all shapes and sizes, hard or soft, can be neatly marked without injury. The outfit consists of a jointed steel scriber, one bottle of varnish, one bottle of etching fluid, one bottle of cleaning fluid, a camel's hair brush and full directions for using. All packed in a neat wooden box. Price $1. Send for catalog

SAWYER TOOL MFG. CO., Fitchburg, Mass.

The Patent Equalizing Driver



is one of the distinct and valuable features of **Pratt's Improved Positive Driving Drill Chuck.** Self-adjusting. Permits jaws to enter and align drill accurately in chuck. Always true and impossible to slip while working. Patented taper steel sleeve. Every part constructed for durability.

PRATT CHUCK CO., Frankfort, N. Y.
European Representatives—Selig, Sonnenthal & Co., 85 Queen Victoria St., London, England.

TERROR TO THIEVES!

ONE FREE

The cheapest and most effective Burglar Alarm ever made. Rouses entire household. Agents write for territory. Guaranteed article. Good money. Send stamp.

PERRY AUSTEN MFG. CO.,
320 Park Place, • • • • New York

Valuable Volumes

JUST OUT

Modern Gas-Engines and Producer-Gas Plants

By R. E. MATHOT, M.E.

314 Pages Bound in Cloth 152 Illustrations

Price $2.50, Postpaid

A Practical Guide for the Gas-Engine Designer and User.

A book that tells how to construct, select, buy, install, operate, and maintain a gas-engine.

No cumbrous mathematics: just plain words and clear drawings.

The only book that thoroughly discusses producer-gas, the coming fuel for gas-engines. Every important pressure and suction producer is described and illustrated. Practical suggestions are given to aid in the designing and installing of producer-gas plants.

Write for descriptive circular and table of contents.

JUST PUBLISHED

American Tool Making and Interchangeable Manufacturing

By JOSEPH V. WOODWORTH

This is a complete practical treatise on the Art of American Tool Making and System of Interchangeable Manufacturing as carried on to-day in the United States. In it are described and illustrated all of the different types and classes of small Tools, Fixtures, Devices and Special Appliances which are, or should be, in general use in all machine manufacturing and metal working establishments where economy, capacity and interchangeability in the production of machined metal parts are imperative.

All of the tools, fixtures and devises illustrated and described have been, or are, used for the actual production of work, such as parts of Drill Presses, Lathes, Patented Machinery, Typewriters, Electrical Apparatus, Mechanical Appliances, Brass Goods, Composition Parts, Mould Products, Sheet Metal Articles, Drop Forging, Jewelry, Watches, Metals, Coins, etc.

The treatment of each tool described and illustrated is such as to enable any Practical Man to Design, Construct and use Special Tools, Dies and Fixtures, for the Rapid and Accurate Production of Metal Parts interchangebly.

To the Machinist, Tool Maker, Designer, Die Maker, Superintendent, Manager and Shop Proprietor this book shows the 20th Century Manufacturing Methods and Assists in Reducing the Expense and Increasing the Output and the Income. A book on the System of Interchangeable Manufacturing—The System that has Won for the United States the Industrial Supremacy of the World.

535 Pages Bound in Cloth 600 Illustrations

PRICE $4.00

MECHANICAL MOVEMENTS

Powers, Devices, and Appliances

By GARDNER D. HISCOX, M.E.

Large 8vo. 402 Pages. 1,649 Illustrations, with Descriptive Text. Price $3.00.

MECHANICAL APPLIANCES

Mechanical Movements and Novelties of Construction

By GARDNER D. HISCOX, M.E.

Being a Supplementary Volume to the Author's Work entitled Mechanical Movements, Powers and Devices.

Contains 1,000 Special Made Engravings. 400 pages. Cloth Bound.

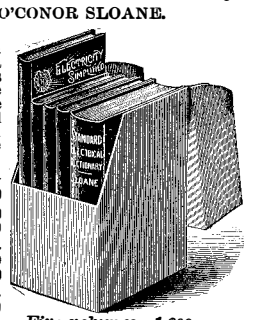
Price $3.00.

The above two volumes sold together for $5.00 postpaid.

A Complete Electrical Library.

By Prof. T. O'CONOR SLOANE.

An inexpensive library of the best books on Electricity. Put up in a neat folding box, as shown in cut. For the student, the amateur, the workshop, the electrical engineer, schools and colleges. Comprising five books, as follows:



Arithmetic of Electricity 138 pages, . . . $1.00
Electric Toy Making, 140 pages, ... $1.00
How to Become a Successful Electrician, 189 pages, ... $1.00
Standard Electrical Dictionary, 682 pages, $3.00
Electricity Simplified, 158 pages, ... $1.00

Five volumes, 1,300 pages and over 450 illustrations.

A valuable and indispensable addition to every library.

Our Great Special Offer.—We will send prepaid the above five volumes, handsomely bound in blue cloth with silver lettering, and inclosed in a neat folding box, as shown in the illustration, at the **Special Reduced Price of $5.00** for the complete set. The regular price of the five volumes is $7.00.

JUST PUBLISHED

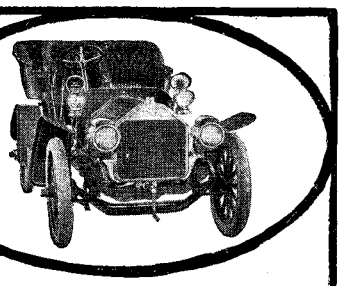
American Estates and Gardens

By BARR FERREE

4to. 11 x 13½ inches. Illuminated Cover and 275 Illustrations. 340 Pages, Price $10.00

☞ *Special circular of contents of these volumes sent free*

MUNN & CO.
361 Broadway New York City



PEERLESS Direct Drive
TOURING CARS

are justly celebrated for the correctness of their mechanical construction. Every mechanical detail of the 1905 models has been simplified and perfected.

The new Peerless motors are of unique design, simple in construction and instantly accessible. They are exactly like the motor in the famous "Green Dragon," the holder of all world's records. These new motors show wonderfully increased power and have created a decided sensation.

Write for 1905 Catalogue

which shows the graceful lines of the new Peerless models, explains the Peerless mechanical simplicity and gives the reasons for the greater efficiency of the new Peerless motors.

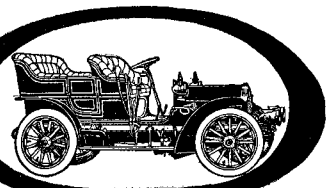
24 H. P. $3,200 35 H. P. $4,000
60 H. P. $6,000

The Green Dragon booklet, giving a complete record of the Peerless racing season is sent on request.

PEERLESS MOTOR CAR CO.
38 Lisbon St., Cleveland, Ohio
Member Association Licensed Automobile Manufacturers.

THE ELECTRICAL AGE
25 Cents a Copy
The Best Electrical Paper Published
THE ELECTRICAL AGE
3 West 29th Street, New York

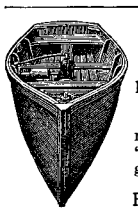
$39.50 BUYS THIS
We save you dealer's profits. Ship on approval 30 days free trial. Money back if not satisfactory. Send for 200 page Style Book containing 132 wonderful bargains.
UNION BUGGY CO.
Dept. 849 Pontiac, Mich.



8 REASONS
WHY THE
Locomobile
is "Easily the Best Built Car in America"
1. Standard design.
2. No freak features.
3. Special material.
4. All material analyzed.
5. Forgings throughout.
6. Interchangeable parts.
7. Solid forged axles.
8. Indestructible bearings.

Locomobile Co.
Bridgeport, Conn.

GLOBE MARINE GASOLINE ENGINE
Thoroughly Reliable
Simple in Construction
Unsurpassed as Auxiliary Power
Suitable for Launches or Working Boats
WRITE FOR CATALOGUE
PENNSYLVANIA IRON WORKS CO
5009 Lancaster Avenue, PHILADELPHIA, PA.



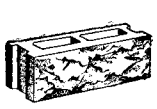
$95.00
Buys our 12 or 14-ft. *Fishing Launch*

Equipped with our celebrated ¾ H. P. motors. Known over the world as the "Bull Pup." Complete catalog of engines for asking.

FAIRFIELD MOTOR WORKS, Fairfield, Conn.

The Nickel Plate Road between New York and Boston and Cleveland, Fort Wayne and Chicago.

Lowest rates and elegant equipment make this a favorite route between the above points. Very low Colonist rates to the Pacific Coast and the far West until May 15th. Famous dining car service. Individual Club Meals 35 cents to $1.00. Also a la Carte. A. W. Ecclestone, D. P. A., 385 Broadway, New York City.



A MONEY MAKER
Hollow Concrete Building Blocks, Best, Fastest. Simplest, Cheapest Machine. Fully guaranteed.
THE PETTYJOHN CO.
513 N. 9th Street, Terre Haute, Ind.

THE Nulite Vapor GAS Lamps
For Home, Store and Street
We also manufacture Table Lamps, Wall Lamps, Chandeliers, Street Lamps, Etc. 100 Candle Power seven hours ONE CENT. No Wicks. No Smoke. No Odor. Absolutely safe. THEY SELL AT SIGHT. Exclusive territory to good agents. Write for catalogue and prices.
Chicago Solar Light Co. Dept. G, Chicago

Brake shoes, making, J. D. Gallagher	787,092
Brake spindle and ratchet handle, compound geared, L. Pfingst	786,989
Brake system, fluid pressure, M. W. Hibbard	787,332
Bread preserving device, W. Biber	787,021
Brick machine, D. J. C. Arnold	787,019
Brick machine attachment, W. C. Burgum	787,075
Brush and connection, fountain, A. W. Nicholls	786,985
Brush cleaner, hair, F. Martucci	787,201
Brush, fountain, P. H. Clingan	787,278
Brush or broom moistener, W. A. Fuller	786,802
Buckle, trace, W. L. Walton	787,015
Building block, W. J. Faulkner	786,884
Building block, J. H. Jones	786,971
Building blocks, manufacturing, D. W. Lloyd	787,199
Bulkhead door control, L. A. Hawkins	787,293
Bundling apparatus, J. H. Irving	787,183
Burglar alarm, C. O. Miller	786,912
Button, campaign, J. L. Bieder	787,067
Can cover, C. A. Crane	786,957
Canning and cooking apparatus, J. C. Garner	786,803
Cane and stool, convertible, S. C. Garden	787,166
Cane fabric, machine for inserting diagonal strands in woven, F. H. Janson	787,185
Cane, macerating sugar, M. Lorenz	787,102
Cane mills, intermediate apron conveyer for sugar, M. Lorenz	787,101
Cap, H. Seide	787,121
Capsule cutter, E. Happe	786,892
Car door, J. W. Hawn	786,896
Car door lock, T. Drakes	786,961
Car, mine water, W. J. Richards	787,112
Car motor, hand, J. T. H. Drake	787,283
Car register protector, street, F. Paduveri	786,988
Car tank, P. P. Sturdevant	787,130
Cars or other vehicles, ventilating device for tram, Stanley & Anger	787,126
Carbon articles, heating, F. J. Tone	786,859
Carbureter, rotary, D. B. Young	787,254
Cards, playing, W. H. Higgins	787,295
Carrier. See Egg carrier.	
Casing head, C. C. Poole	786,838
Casting apparatus, F. Cowden	787,325
Cement mixer, C. Brent	787,071
Cement tanks, apparatus for forming, J. T. Donahoo	787,157
Chain link, permeable, J. W. Hyatt	786,904
Check controlled apparatus, W. B. Wheeler	786,866
Chimney and lining therefor, J. M. Bragg	787,267
Chuck, spindle turning machine, A. Thorsby	787,133
Churn, H. H. & S. L. Hunter	787,180
Churn power, M. Grimm	786,805
Cigar rolling table and wrapper cutter, I. Liberman	786,979
Cigarette packages, machine for making up, Y. Lazaga	787,100
Clarinet mouthpiece, F. Starke	787,127
Clock, electric, M. Fischer	787,091
Clutch for motor cars, etc., friction, L. Girardot	787,031
Clutch, friction, A. P. Brush	787,072
Coffee bean polishing and finishing machine, F. D. Barros	787,143
Coffee pot strainer and holder combined, W. A. Wasserman	786,865
Collapsible gate, A. Clark	786,951
Combing machine, Wenning & Gegauff	787,139
Concrete block mold machine, E. Keagy	787,099
Conveyer conduit elbow, H. J. Podlesak	786,991
Conveyer, pneumatic, J. M. Akers	786,791
Cop or cord package, S. W. Wardwell	786,863
Cot, folding, J. J. Mackle	786,908
Cotton chopper, J. M. Sutton	787,060
Cotton picker, J. Summerfield	787,314
Cotton picker's wagon, G. G. Richards	786,995
Coupling, Hockney & Curtiss	787,296
Cover for vessels, protecting and ventilating, F. Kregczy	786,974
Crate, banana, H. Sexton	787,124
Crate, folding or knockdown, C. Hoskins	786,813
Crutch, A. L. Smith	786,921
Cultivator, straddle row, W. S. Barton	787,261
Curling iron, J. Oppenheimer	786,987
Current machine, monophase and polyphase alternating, M. von Dolivo-Dobrowolsky	787,027
Current meter, direct, J. S. Anthony	787,250
Current motor, alternating, M. Milch	787,305
Current series motor, alternating, M. C. A. Latour	787,303
Current transforming means, direct, O. O. Kruh	787,192
Current transforming means, direct, C. P. Steinmetz	787,228
Currycomb, Hackett & Hodges	787,037
Curtain and shade fixture, C. A. Rought	786,998
Cuspidor, J. Johnson	786,970
Cycle support, motor, J. J. Bourcart	787,070
Dam for irrigating ditches, G. H. Duke	787,028
Dampening machine, Currier & Leitschuh	786,958
Deposition tank, Lewis & Corey	786,978
Door fastening device, grain, J. J. Hahn	787,038
Door lock and check, combined portable, R. M. McMahon	786,831
Door, screen, or curtain, G. J. Record	786,841
Dough feeding mechanism, A. W. Copland	787,081
Dough for making pie crusts, spreading, J. H. Burns	787,274
Dough forming machine, C. F. Dietz	786,879
Dough rolling or spreading apparatus, J. H. Burns	786,880
Dredger, turning shovel, Bode & Bottcher	787,273
Dredgers, etc., spud grip for, J. W. Hollenbeck	787,022
Drill bit, rock, S. B. Clark	786,968
Drum or barrel head cutter, J. L. & T. C. Sheppard	786,952
Drying vegetable, mineral, animal, and compound substances, E. Gathmann	786,849
Dye and making same, claret red mordant, A. L. Laska	787,093
Dyeing machine, skein, W. H. Fletcher	787,046
Dynamo, E. B. Jacobson	787,285
Egg carrier, Finn & Pike	787,184
Egg case partition, removable, F. W. Meyer	786,886
Electric apparatus protective device, L. Wilson	786,827
Electric conduit terminal, Miles & Patterson	787,319
Electric currents, variable resistance or conductor for, W. H. Fahrney	786,911
Electric machine, dynamo, T. B. Hatch	787,089
Electric machine, single phase dynamo, M. C. A. Latour	787,292
Electric motor, continuous current, H. Pecheur	787,302
Electric motor system, C. P. Steinmetz	786,918
Electric recording instrument, Steele & Kratt	787,227
Electric resistance, H. W. Leonard	787,005
Electric time relay switch, W. W. Lackie et al.	787,047
Electric time switch, R. D. Jones	786,907
Electric wire conduits, rosette or receptacle for, G. A. Lutz	787,187
Electrical distribution system, W. A. Turbayne	787,338
Electricity meter, F. Lux	787,012
Electrolytic method, A. S. Ramage	786,823
Elevator locking mechanism, J. S. Muckle	787,221
Elevator safety device, F. B. Austin	787,208
Engine. See Beating engine.	787,258
Engine, C. R. McGahey	786,983
Engine sparking igniting device, hydrocarbon, J. W. Packard	787,212
Engine speed controlling means, steam, J. H. Clark	787,149
Engine starter, gas, Mitchell & Lewis	787,341
Excavating trenches, etc., apparatus for, W. Heffron	787,040
Fabric trimming and sewing machine, F. Neveux	786,833
Facing block, A. E. Buell	787,023
Feed regulator, automatic, H. J. Averbeck	786,942
Feeder, boiler compound, J. F. McCanna	786,914
Fence post, L. K. Bush	787,275
Fence post, steel, H. F. J. Sieverkropp	786,850
Fence weaving machine, wire, G. W. Whittington	786,927
Fencing tie, wire, S. S. Withington	786,931
Fire alarm apparatus, electrical, J. P. Robertson	787,344
Firearm lock, L. Cobb	786,796
Firearm, magazine, W. B. Atkinson	787,257
Fishing pole and reel, F. Schreidt	787,055
Fishing reel, automatic, J. H. Van Horn	787,317
Floor and ceiling plate, J. W. Carleton	787,077
Flue or tube cutter, R. T. Miller	787,205
Fluid delivery apparatus, R. L. Doran	786,881
Flushing apparatus, H. W. Gardner	787,287
Foot warmer, C. H. Whitaker	787,245
Frequency changer, O. O. Kruh	787,193

This Box of Cigars Free to You

We want to send you a sample box of La Reclama Examiner Cigars without any cost except postage.

We will forward free of cost a sample box of La Reclama cigars to any *Havana cigar smoker who will send us his business letter head or business card, accompanied by the coupon properly filled out, that is printed in the corner of this advertisement and ten cents for mailing*

There is no charge whatever for these trial cigars. We know from experience that a trial will make you a permanent customer.

Our sole object is to demonstrate that there is not a smoker in this country whose cigar needs cannot be supplied with better value for less money than from any other source, by purchasing direct from our Factory at Wholesale Prices. We are the originators of the **"Direct from Factory to Consumer"** plan. Its success was wonderful and now has imitators. With our La Reclama cigars we originated the plan of **"Shipping on Approval."** The result was successful beyond our expectations. Trial shipments have been satisfactory except in rare cases, and with but few exceptions always resulted in permanent customers.

We Want Every Smoker In The UNITED STATES To Know LA RECLAMA CIGARS

With such demonstrated success we now, to introduce our Examiner Cigars, make this original and startling offer of a sample box absolutely **FREE**. Your receiving and smoking them does not obligate you in any way as the trial box is free of all cost. We simply want you to try them, knowing from experience that *the cigars themselves* will make you a steady customer.

We are so certain of our ability to please the taste of discriminating smokers that we have determined to bear the entire expense of proving to you the luxury and economy of La Reclama Examiner Cigars. We are so positive that the free trial box we will send you will please you, and that we shall have your patronage hereafter, that we make this extraordinary offer. It is extended to permanently located **responsible individual smokers** only who have **not yet tried our cigars.**

Is it worth your while to secure better cigars for half the price you pay the storekeepers? Is it worth your while to save the expense of traveling salesmen? Is it worth your while to save the profits of the jobber and retailer? Is it worth your while not to be assessed for the bad debts many of the latter pile up with other manufacturers?

The cigars we will send you are from our regular stock. They are the same High Grade Cigars we are selling to thousands of satisfied customers in all parts of the country. Every stage, from the leaf in the field to the stamp on the box, has the careful personal supervision of trained experts. It will be a revelation to you to know the values we have to offer.

We know that our Examiner Cigars ($5.00 per 100) are better than many cigars sold three-for-a-quarter at retail. Our Customers tell us these Examiners beat any 10c. cigar they can buy elsewhere.

We make 30 different styles of Clear Havanas at Money-Saving prices. Our Smokers' Guide and Chart tells Why and How.

Year in and year out we get thousands of testimonials from all parts of the United States.

"My last order received. I wish to say that I have smoked cigars for forty-five years and have used some brands for years at a time, but never have found any that suited me as well as La Reclama. I believe them better goods than I have been paying $20 per 1,000 more for. I also found them uniform in flavor, all free smokes with a nice sweet aroma."

Supt. Large Manufacturing Concern,
Springfield, Mass.

Reference names supplied by

LA RECLAMA CUBAN FACTORY
1895 FIRST AVE., NEW YORK CITY
ESTABLISHED 1875

Refer: Union Exchange Bank, Fifth Ave.; Bradstreets; Dun.

LA RECLAMA CUBAN FACTORY, N. Y. City

GENTLEMEN: Please send me FREE, all charges prepaid, a sample box of La Reclama Examiner Cigars. I enclose my business letter-head or business card and ten cents for mailing and package.

The Color (Strength) I prefer.....
Name of Cigar I usually smoke.....
My Name.....
Address.....

Cigar dealers are excluded from this offer. Applicant must be a permanently located responsible individual smoker. s-am-4

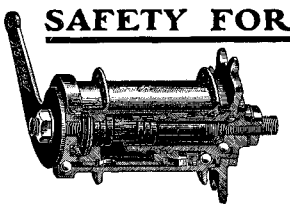
MICROSCOPES

New Students' Compound Microscope, full outfit, - $6.00
New Small Laboratory Microscope, full outfit, - - 9 00
New Large Laboratory Microscope, full outfit, - - 18.00

Instructions and complete outfit of mounting material with each microscope. Send for lists
Dept. 6, WILLIAMS, BROWN & EARLE, 918 Chestnut St., Philadelphia, Pa.

SAFETY FOR CYCLISTS.

"When cycling do not trouble borrow.
But *brake* yourself with the safe MORROW."

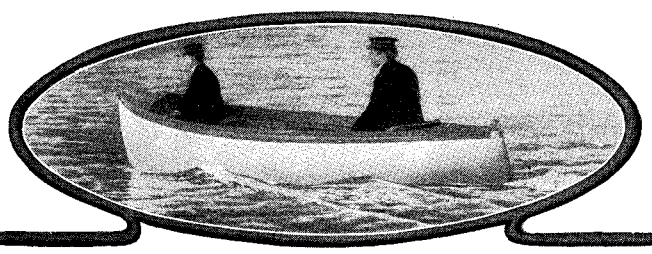


Every wheelman in the country ought to know that the greatest security for himself and his machine is afforded by the attachment of

THE MORROW BRAKE

One clutch—the Forward Drive—only. No increased friction when pedaling. Easily taken apart when necessary. Chief parts are cut from solid steel. Holds the wheel in perfect control so that it can be stopped instantly. Interior parts of brake turn with brake itself when coasting. All parts interchangeable. No friction of interior parts. Price complete **$5.00.** Booklets sent free.

ECLIPSE MACHINE CO. Elmira, N. Y., U. S. A.



Mullins Stamped Steel Boats Can't Sink

Motor Boats, Row Boats
Hunting and Fishing Boats

Staunchly built of strong, rigid steel plates, with air chambers in each end like a life boat—buoyant—strong—safe—speedy. They don't leak, crack, dry out, wear out or sink.

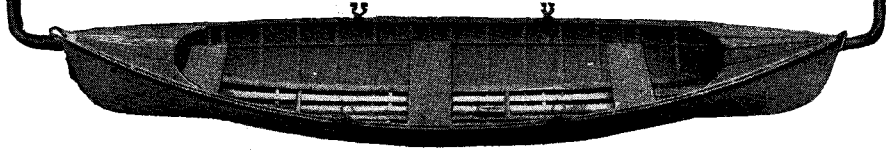
Mullins Steel Motor Boats are elegantly equipped, full fledged, torpedo stern launches—not row boats with motors in them.

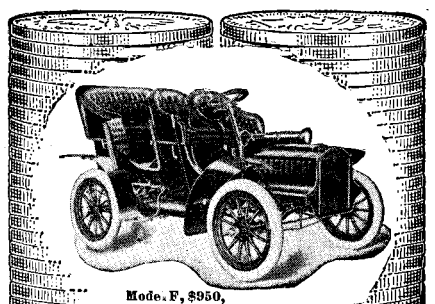
Motor Boats, 16 foot, 1½ h. p., $135; 18 foot, 3 h. p., $240. Row Boats $20 up.

All boats are sold direct and every boat is fully guaranteed.

Every Boatman Should Send for 1905 Catalogue
which shows all our new models and many innovations in boat building.

The W. H. Mullins Co. (The Steel Boat Builders) **118 Franklin St., Salem, Ohio.**
Member National Association of Engine and Boat Manufacturers.





Mode. F, $950, f.o.b. Detroit

How Dollars Are Saved With A CADILLAC

Among all automobiles the Cadillac stands pre-eminent for its low cost of maintenance. Simple, durable, common-sense construction makes it truly the "Car of Economy."

Because of simplicity of power-development and efficiency of transmission there is practically no energy lost in the Cadillac—a feature which alone reduces by a big percentage the cost of fuel, lubrication, etc.

The Cadillac mechanism is designed with a view to making it virtually *trouble-proof*, with the result that the liability of damaging the motor or its connections through a mistake in manipulation is reduced to a minimum. Absolute control at all times and under all conditions is maintained more easily—*with fewer things to think of*—in the Cadillac than in any other machine. This means that the Cadillac is the safest, the most reliable and most easily operated of all motor cars.

Model F—Side-Entrance Touring Car shown above, $950.

Model B—Touring Car, with detachable Tonneau, $900.

Model E—Light, stylish, powerful Runabout, divided seat, $750.

Model D—Four-Cylinder, 30 h. p. Touring Car, $2,800.

All prices f.o.b. Detroit.

Write for Catalog N, and address of nearest dealer, where you can see and try a Cadillac.

CADILLAC AUTOMOBILE CO., Detroit, Mich.

Member A. L. A. M.

THE ELECTRICAL AGE

25 Cents a Copy

The Best Electrical Paper Published

THE ELECTRICAL AGE

3 West 29th Street, New York

A. W. Faber.

Manufactory Established 1761.

Lead-Colored Slate Pencils, Rubber Bands, Erasers, Inks, Penholders, Rulers, Water Colors, Improved Calculating Rules.

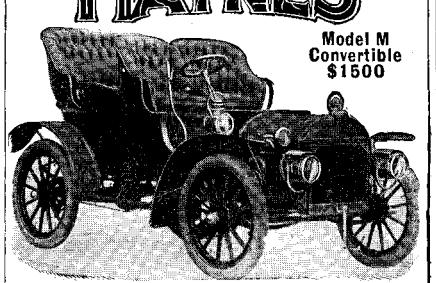
Send for descriptive Circular S.

44-60 East 23d Street, New York, N. Y.

Grand Prize, Highest Award, St. Louis, 1904.

HAYNES

Model M Convertible $1500



FEATURES

Shaft drive with "Haynes" Sprocket and Roller Gear—no chain dirt and noise nor breaking links—four times the strength of beveled gears.

The only Roller Bearing Motor in the world—will develop 20 horse power.

One piece Nickel Steel rear axle. Weldless steel front axle.

Cast Aluminum Seats.

Roller Bearings throughout.

The very best Hand Buffed Leather and Curled Gray Hair used in upholstery.

Eighteen coats of paint and varnish.

Three speeds ahead and reverse.

Single lever control.

Built in an Automobile factory.

Compare these features with the entire market—then buy wherever you get the best value.

Haynes cars are the result of 12 years' experience in motor car building. Send for descriptive catalogue—visit the factory or let's arrange for a demonstration with our nearest agent.

The HAYNES-Apperson Co. - Kokomo, Ind.

Member A. L. A. M.

PIONEER BUILDERS OF GASOLINE CARS IN AMERICA

1715 Broadway, New York 1420 Michigan Ave., Chicago

Fruit gathering device, E. Tatum	786,855
Fruit picker, F. Fisher, Jr.	787,164
Fumigator and insect-destroyer, J. A. Frazar	786,965
Furnace door, E. E. Slick	786,851
Furnace hearths, means for protecting blast, Dinkey & Brassert	787,282
Furnaces, reversing valve for regenerative, J. Reuleaux	787,222
Game apparatus, E. Fahl	787,161
Game, ball and bat, E. Rosenthal	786,997
Garment supporter, H. E. Crandall	786,876
Gas burner, W. McLaughlin	786,830
Gas burner, F. M. Ashley	787,321
Gas furnace, J. C. Swindell	787,131
Gas-lighting device, A. F. Williams	786,928
Gas retort stand pipe, J. H. Taussig	787,061
Gas safety valve mechanism, automatic, E. Leadbeater	787,195
Gate, Van de Walker & Jenney	787,242
Gate operating mechanism, J. E. Stirton	787,129
Gates, variable counterpoise for, Hawkesworth & McCulloch	787,175
Gear, transmission, G. R. Albaugh	786,939
Gear, variable speed, F. W. Schroeder	786,845
Gearing, S. H. Hanson	787,330
Gearing, compensating, E. C. Doolittle	787,085
Gearing, variable speed, W. C. Conant	787,080
Glass molding machine, E. Miller	787,050
Glass strips, splitting longitudinally scored, P. Semmer	787,122
Gooseneck connection, A. W. Nicholls	787,211
Governing device, R. B. McGowan	786,984
Grading implement, R. S. Sheldon	786,848
Grain conditioner, C. E. Oliver	787,108
Grain spout, A. W. Hamler	787,291
Grinding and polishing wheel hood, H. N. Middleton	787,340
Gun carriage, recoil, A. H. Emery	786,964
Guns, mounting and operating, A. H. Emery	786,963
Hair drying comb, T. P. Cheevers	787,148
Hammer attachment, drop, R. F. Massa	787,339
Hammer, power, Heinrich & Dorsch	787,331
Harrow, Smith & Kindred	787,004
Harrow, O. Tower	787,011
Harrow and cultivator, J. A. Beard, Sr.	787,263
Harvester and husker, corn, E. Hollis	786,811
Harvester attachment, corn, J. Wilcox	787,246
Harvester, beet, J. Beal	787,262
Hat and coat locker, W. E. Arbingast	786,869
Hat frame forming device, E. A. Howe	787,042
Hats, portable holder for ladies', M. S. Hellman	787,098
Hay press, H. M. Tallman	787,132
Headlight, dash, F. W. Dressel	787,158
Heat storage box, C. N. Rounseville	786,999
Heater. See Water heater.	
Heating systems, etc., drain attachment for steam, Gifford & Nistle	787,094
Heel, boot or shoe, J. O'Meara	786,986
Heel, detachable, F. B. Moss	787,306
Heel plate, felt boot, D. Smith	787,226
Hide or leather working machine, G. W. Baker	787,259
Hinge cutting machine, G. B. Taylor	787,232
Hoisting apparatus, J. Spelman	787,058
Hoisting machines, automatic safety switch for, O. S. Hertzog	786,809
Honey extractor, F. G. Marbach	787,104
Horse detacher, D. C. Bruner	787,270
Horses, device for the breaking in of, H. Schuleter	787,116
Horseshoe, E. A. Hennessy et al	786,966
Horseshoe, metal, C. Heart	787,097
Hydraulic coupling, J. J. Delehant	787,154
Incandescent-lighting fixture, L. R. Hopton	786,812
Indexing, book, R. C. Pohl	787,111
Injector, Kremer & Alderfer	736,906
Inking device for numbering or marking machines, etc., F. W. Merrick	786,910
Inkstand, E. Davis	786,959
Insulator, telegraph or telephone wire, McDaniel & Graves	787,107
Iron from ore separating tanks, means for recovering magnetic, E. S. Bennett	786,946
Japanning small articles, machine for, T. A. Perrins	787,213
Juice extracting machine, J. W. Hyatt	786,902
Juice extracting machine link and chain, J. W. Hyatt	786,903
Keyhole guard, R. I. Robeson	786,842
Knee rest or support, E. C. Bispham	787,068
Knitting machine, J. W. Adams	786,938
Knitting machine stop motion, G. W. Ruth	787,115
Knockdown box or crate, J. R. Thomas	786,858
Ladder handle forming machine, J. S. Stevenson	787,128
Lamp air baffler, T. S. Leese	787,196
Lamp, alcohol, Sternau & Strassburger	787,006
Lamp, electric arc, B. Jackisch	787,043
Lamp, gas, J. & G. G. Doorenbos	787,086
Lamps, automatic safety extinguisher adapted to single and duplex burners for oil, W. H. O'Keefe	786,917
Lantern pinion, E. W. Horn	787,041
Laundry dampening tool, H. M. Forbes	786,889
Lawn-trimmer, J. H. E. Peters	787,214
Leg, artificial, C. B. Winn	787,250
Lintel construction, J. Kahn	786,820
Locomotive fire box, C. Vanderbilt	787,241
Log turning device, O. D. Simmons	787,125
Loom protecting mechanism controller, J. Robinson	787,114
Loom shedding motion, P. Dietz	787,026
Loom take-up mechanism, Crompton & Fitton	787,281
Lorry or dumping-car, Wellman & Seaver	786,926
Lubricator, C. Callahan	786,871
Lubricator, E. Denegre	787,155
Marker and punch, interchangeable, E. J. Hansén	787,348
Match deliverer, lighter, and cigar cutter, combined, P. La Belle	787,334
Mattress, pneumatic, R. B. Wiltsie	786,930
Mattresses, etc., stay for pneumatic, F. Webb	787,137
Mechanical movement for controlling threading dies, F. H. Easby	786,882
Metallic leaf, machine for forming package rolls of, W. H. Coe	786,953
Milk, condensed, S. R. Kennedy	787,044
Milk cooler, A. W. Lichtfeld	786,822
Mine-curtain raiser, G. W. Manlove	787,200
Miner's dumping cage, F. C. Kerst	787,189
Mirror support, adjustable, J. Banderob	787,260
Miter box, H. F. Stuebe	787,230
Molding machine, E. D. Misner	786,980
Molding machine, A. Choiniere	787,078
Molding machine, D. W. Lloyd	787,198
Motor. See Car motor.	
Motors, operating alternating current, W. A. Layman	787,336
Movement cure apparatus, M. E. Gibson	787,168
Music leaf turner, B. Burke	787,272
Musical instrument, stringed, F. X. Audet	786,941
Nail feeding mechanism, J. L. Perkins	786,835
Nail holder, J. E. Plank	787,217
Napping machine, H. S. Greene	787,095
Nut lock, T. B. & M. F. Earhart	787,088
Oil burner, Kipling & Worden	787,045
Opera chair, A. Lazarus	787,337
Ophthalmoscope, H. L. De Zeng	787,083
Ore concentrator, P. H. Craven	786,799
Ore roasting furnace, A. C. Johnson	786,905
Ores or compounds preparatory to smelting, treating sulfid, Huntington & Heberlein	786,814
Organ, reed, D. Schustek	787,056
Oven deflector, J. F. Bixler	786,947
Packing, metallic, W. H. Law	786,976
Packing washer, C. G. Ette	787,160
Palette and color dish, combined artist's, R. W. Semple	787,123
Paper machine, K. E. Rogers	786,996
Partition construction, R. Markgraf	786,826
Pasting box, H. G. La Sor	786,975
Pen, fountain, S. H. Hodges	786,967
Pen, self-filling fountain, J. T. Davidson	787,152
Pencil sharpener, E. Woodbury	786,933
Pendulum mill, J. Wustenhofer	787,018
Phase-rotation indicator, R. F. Schuchardt	787,345
Photographic plates or the like in open daylight, developing, J. N. Ludwig	787,103
Piano actions, bracket for grand, E. Bornhoeft	787,069
Piano, etc., back, J. Breckwoldt	787,268
Pianos, coin-controlled actuating mechanism for autopneumatic, A. J. Hobart	786,899
Picture-exhibiting apparatus, R. Cohen	786,954
Picture hook, B. Lehman	786,977
Pie-making machine, J. C. Hutchison	786,816
Pipe connection, sewer and soil, W. F. J. Lutz, reissue	12,337
Pipe or hose coupling, W. J. Williams	786,929

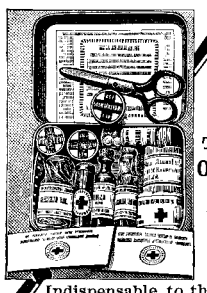
ORDER NOW

Rushton Canoes

INDIAN GIRL MODEL

Combines speed with lightness, strength with gracefulness, and is built throughout of seasoned white cedar covered with best quality canvas. Lengths 15, 16, 17, 18 feet. Price, packed, $32 to $44. Send for catalogue of pleasure boats, all-cedar and canvas-covered canoes, oars, paddles, sails and fittings.

J. H. RUSHTON, 819 Water Street, Canton, N. Y.



IN CASE OF ACCIDENT

IT IS GOOD POLICY

To have for immediate use

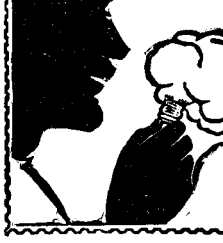
Our U. S. Emergency Case

containing all necessary appliances and remedies. Sterilized and antiseptic. Neatly arranged in beautiful handy metal case—with full instructions for "first aids to the injured." Indispensable to the traveler, autoist, workshop and the home. Sent to any address on receipt of $1.00. **Agents Wanted.**

U. S. EMERGENCY CASE CO.

UTICA, NEW YORK

WILLIAMS' SHAVING SOAP



"The only *Real* Shaving Soap"

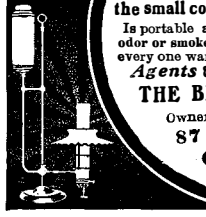
Williams' Shaving Sticks, Shaving Tablets, Toilet Waters, Talcum Powder, Jersey Cream Toilet Soap, etc., sold everywhere.

Write for booklet "How to Shave"

THE J. B. WILLIAMS CO.

Glastonbury, Conn.

THE "BEST" LIGHT



The most brilliant, economical light made. Our light gives 100-candle power at the small cost of 2c per week.

Is portable and there is no dirt, grease, odor or smoke. Over 100 different styles—every one warranted.

Agents wanted Everywhere.

THE BEST LIGHT CO.

Owners of Original Patents.

87 E. 5th St., Canton, O

Agents Wanted

in every locality. **Attractive inducements** for permanent, profitable occupation. Previous experience not required.

KEYSTONE Fire Extinguisher

Examined and approved under the standard of the National Board of Fire Underwriters—the **cheapest and best approved** extinguisher. In some localities this agency can be carried with other business interests. Write to-day for booklet and full particulars.

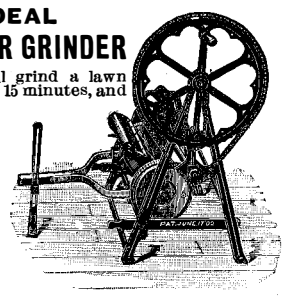
JAMES BOYD & BROTHER

18 N. Fourth Street, Philadelphia, Pa.

Mfrs. of Fire Protection Equipment.

THE IDEAL LAWN MOWER GRINDER

This machine will grind a lawn mower perfectly in 15 minutes, and is destined to revolutionize the whole business. Greatly improved over old models, and is now perfection. Energetic men and boys make $10 per day using it. Nothing like it on the market.



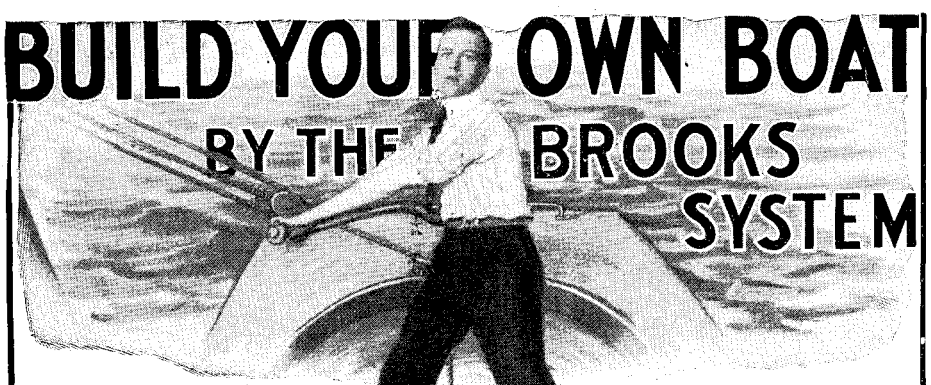
For prices, etc., address the manufacturers,

THE ROOT BROS. CO., Plymouth, Ohio

HOW TO MAKE AN ELECTRICAL

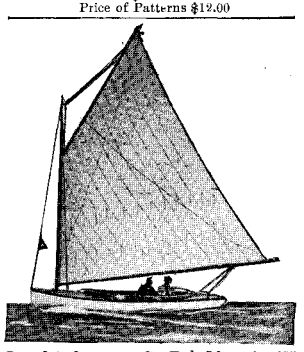
Furnace for Amateur's Use.—The utilization of 110 volt electric circuits for small furnace work. By N. Monroe Hopkins. This valuable article is accompanied by detailed working drawings on a large scale, and the furnace can be made by any amateur who is versed in the use of tools. This article is contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **1182.** Price 10 cents. For sale by MUNN & Co., 361 Broadway, New York City, or by any bookseller or newsdealer.

BUILD YOUR OWN BOAT BY THE BROOKS SYSTEM



Length 25 ft., beam 6 ft. To build requires 900 ft. of lumber and $15.00 worth of hardware. Price of Patterns $25.00

Length 22½ ft., beam 6 ft. To build requires 410 ft. of lumber and $10.00 worth of hardware. Price of Patterns $12.00



Length 18 ft., beam 5 ft. To build requires 275 ft. of lumber and $7.00 worth of hardware, exclusive of rigging. Price of Patterns $10.00

We have over 40 styles and sizes of boats and patterns.

THERE is no reason why you cannot own as good a boat as the best boat factory can produce if you will use your leisure time to advantage and build it yourself. The fact that anyone using the **Brooks System,** no matter how inexperinced he is in the use of tools, can build his own boat at the cost of a little lumber and a few nails, has brought boats within the reach of all. All the boats built last year, by all the boat factories in the United States, combined in one fleet, would not equal the number of boats built during the same time by novices using the **Brooks System.** You will find pages of testimonials from these successful amateur builders in our catalogue.

The **Brooks System** consists of **exact size printed paper patterns** of every piece that goes into the boat, a complete set of **halftone illustrations,** showing an actual picture of each step of the work properly done, **detailed instructions** to build, covering the entire construction of the boat, and an itemized bill of all material required and how to secure it.

We tell you how to lay the pattern of each particular part on the proper piece of material and exactly how to cut—you cut. We then tell you how to fasten each part in its right place—what kind of a nail to use—how to drive it—you drive it.

You need no mechanical ability, the **Brooks System** supplies this—**how is shown** in the catalogue.

Many professional men are taking up the **Brooks System** for mental relaxation—for the pleasure of working with their hands and for exercise.

We have started hundreds in the boat-building business. One man built sixteen boats from **one set of patterns** last season—another built ten—the materials cost very little—we furnished the design—they did the work and sold the boats at a big profit.

You need buy nothing from us but the patterns. We have them of **all kinds** and **sizes,** from a small rowboat to a 51-foot cruising yacht.

Over six thousand amateurs successfully built boats by the Brooks System last year.

When so ordered, Patterns are Expressed, the Charges Prepaid, C. O. D., Allowing Examination.

KNOCK DOWN BOATS COMPLETE

from keel to cushions and fittings. We send you a complete Knocked Down Boat, even to the paint, at a cost of very little more than the cost of the raw material.

Catalogue with full particulars **free.** For **25** cents, 100-page catalogue, showing several working illustrations taken from the instructions of each boat and a full set for one boat; also valuable information for the amateur yachtsman, rules for sailing, steering, passing, fog and engine signals, etc.

BROOKS BOAT MFG. CO.

ORIGINATORS OF THE PATTERN SYSTEM OF BOAT BUILDING

404 SHIP STREET, BAY CITY, MICH., U. S. A.

One-third of a Century

Standard of the World

A delicious beautifier, preserver and cleanser of the teeth; makes the breath sweet and the gums less tender. **The Metal Box** is a handy package for the toilet table and traveling; no powder to litter; no liquid to spill or stain.

25 Cents, at all Druggists.

C. H. Strong & Co., Props., Chicago, U. S. A.

THE ELECTRICAL AGE

25 Cents a Copy

The Best Electrical Paper Published

THE ELECTRICAL AGE

3 West 29th Street, New York

WORLD'S LEADERS

By Merit - By Achievement

In every tongue; in every clime

UNDERWOOD

has earned its leadership by doing the best work in the shortest time, with least trouble, because of

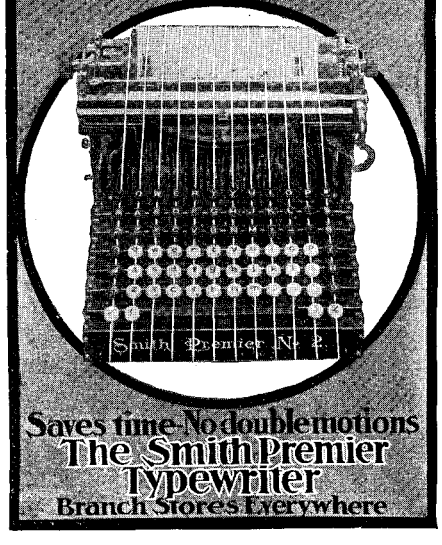
VISIBLE WRITING

"Known by its work"

UNDERWOOD TYPEWRITER CO., 241 Broadway, New York.

Adapted for use with the "Unit Book-keeping System."

Keys in Straight Rows No Shift Keys



Saves time No double motions

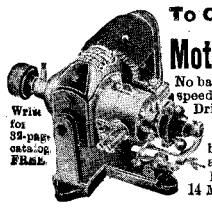
The Smith Premier Typewriter

Branch Stores Everywhere

TYPEWRITERS ALL MAKES

All the Standard machines SOLD or RENTED ANYWHERE at HALF MANUFACTURERS' PRICES, Shipped with privilege of examination. Send for Cat.

Typewriter Emporium. 203 LaSalle St., Chicago



To Gas Engine Operators

Dynamo Ignition.

Motsinger Auto-Sparker

No battery to start or run. The original speed-controlled friction-drive Dynamo. Driven parallel with engine shaft. No belts. No beveled pulley or beveled fly wheel necessary. For make and break and jump-spark system. Water and dust proof. FULLY GUARANTEED.

Write for 32-page catalog. FREE.

MOTSINGER DEVICE MFG. CO., 14 Main Street, Pendleton, Ind., U.S.A.

Pipe or like joint, F. W. Buhne	787,074
Pipe union, J. Bropson	787,144
Pipe wrench, A. E. Powell	786,992
Plane, E. A. & A. F. Schade	787,054
Plow, A. G. Perry	786,836
Plows, adjustable scraper for rotary disk, W. O. Wimer	787,016
Potato digger, M. Altstock	786,792
Powder, means for manufacturing multiperforated bodies of smokeless, H. Maxim	787,105
Press, H. O. Latham	787,301
Press valve-operating mechanism, J. M. Stuart	787,007
Printing, color, M. A. McKee	787,209
Printing machine offset mechanism, H. M. Barber	787,141
Printing machine, stencil, C. L. Burdick	787,271
Printing of calendars, cash and ticket blocks, etc., machine for the, H. Stamm	786,852
Printing press, J. E. Caps	786,872
Propulsion of ships, apparatus for, W. T. Donnelly	787,084
Pulley, sash, P. Dosch	786,800
Pulley, self-lubricating, S. W. Wardwell	786,864
Pulley, sheet metal sash, P. Dosch	786,801
Pump, J. Scholl	787,117
Pump, D. M. Watson	787,244
Pump, Wilson & Mansell	787,247
Pump, W. M. Price	787,308
Pump, centrifugal, Smith & Sherrerd	786,922
Pump, centrifugal, E. G. Harris	787,039
Pump, current operated, Dawson & Hamilton	787,153
Pump-governing device, R. B. McGowan	786,915
Pump, oil, F. J. Young	786,937
Pumping jack, oil well, R. G. Strother	786,854
Punch, W. Ross	787,052
Punch-cutting machine, J. W. Lewis	787,197
Punching machine, F. J. Nutting	786,834
Punching machine, J. A. Groebli	786,890
Punching machine, multiple, E. A. Stickney	786,853
Puzzle, J. D. Midson	787,204
Quilting frame, C. Carter	787,277
Radiator, J. F. Flaherty	786,886
Radio-active substances, instrument for rendering visible the luminous effects produced by, F. H. Glew	787,170
Rag cutter mechanism, C. W. Griffin	787,290
Rail joint, J. T. Qualk	787,220
Rails, compound hinge for depressible, C. J. Diebold	787,326
Railway bumping post, B. Haskell	786,808
Railway carriage coupling, automatic, J. Willison	786,868
Railway collisions, apparatus for preventing, H. Gerstmann	787,029
Railway construction, C. S. Seitz	787,003
Railway, elevated, J. Cooper	786,874
Railway rail guard clamp, E. H. Johnston	787,186
Railway signal, O. W. Hart	786,894
Railway switch, H. Phillips	787,216
Railway tie, Earnest & Gilchrist	786,962
Railway tie, S. McElfatrick	786,982
Railway tie, M. H. Mahar	787,049
Railway track appliance, C. A. Sanborn, 786,919,	786,920
Ratchet drill, F. C. Torrance	787,234
Razor, safety, B. Hirschfeld	786,898
Razor strop, G. E. Maier	787,304
Reel. See Fishing reel.	
Refrigerator, F. A. Hickson	786,810
Register system, A. Fevola	787,163
Respirator, W. G. Gates	787,167
Rheostat, F. E. Goodall	787,032
Rifle magazine attachment, M. H. Cottom	786,798
Rock crusher, E. C. Bacon	787,322
Rocking chair, G. F. Hall	787,171
Rocking chair, C. D. Koeser	787,299
Rods and their supports or other similar devices together, means for attaching, F. M. Seamans	786,846
Rotary engine, J. R. Scofield	787,224
Rubber patch, C. O. Tingley	787,010
Sad iron, P. C. Greenawalt	787,289
Sad iron, O. Tverdahl	787,316
Saddletree, adjustable, T. I. Morrish	787,206
Sash fastener, R. C. Wright	786,936
Sawmill set works, W. H. Trout	787,135
Scaffolding, A. Tingleaf	787,233
Screen, A. V. Siler	787,312
Screw-cutting tool, C. W. Phillips	786,990
Scribing tool for carpenters, etc., D. M. Barnett	787,142
Seaming sheet metal bodies, machine for end, M. J. Kenny	786,973
Separator liner, centrifugal, C. A. & O. W. Hult	787,179
Sewed article seam, R. G. Woodward	786,934
Sewing machine, buttonhole, J. T. Hogan	787,177
Sewing machine feed mechanism, F. W. Merrick	786,909
Shackle, spring, F. E. Geibel	787,288
Shade and curtain hanger, window, M. Van Boxel	787,239
Shade hanger, W. A. Worthington	787,252
Shearing machine valve, E. H. Carroll	787,324
Sheathing plate, H. Mortenson	787,207
Sheet metal vessels, dies for drawing, E. R. Stoddard	787,059
Ships, hydraulic support for, G. & K. Prochazka	786,840
Show case, F. Pollard	786,837
Show case, H. J. S. Lewis	787,048
Show case bracket and fixture, G. C. Wright	786,935
Signal device, electric, L. S. Walle	787,318
Signaling and telephoning on electric trolley or other systems, means for, C. R. Van Trump	786,925
Signaling system, electric, Robinson & Broadhurst	786,843
Skate ankle supporter, A. J. Scriven	787,225
Skate clamp, S. W. Finch	787,090
Smoke-consuming furnace, L. C. Mooney	787,106
Soap dispensing machine, W. B. Moore	787,342
Solar motor, E. P. Brown	787,145
Sound record tablets, composition of matter for, J. Sanders	787,001
Soundings at sea, apparatus for taking, J. W. Gillie	787,030
Speed limiting device, H. F. T. Erben	787,284
Spinning ring frame, O. Dumas	787,087
Sprayer for the wounds of animals, M. F. Havens	787,174
Square, R. C. Lynn	786,824
Square, G. L. Wilson	787,248
Stamp stem guide, F. W. Hooper	786,969
Steam engine, J. A. Tooley	787,134
Steam generating appliance and adaptation of same to locomotives, C. Vanderbilt	787,240
Steam trap, R. G. McAuley	786,981
Steel trap, H. T. Tweedt	787,013
Stereopticon slide carrier, F. C. Edmonds	786,883
Sterilizing milk or other fluids, C. de Jong	786,819
Stitches of finished seams, separating and indenting, J. B. Hadaway	786,891
Stone setting device, free, S. Voss	786,861
Stop motion, electrical, G. B. Cocker	786,797
Store front, M. Salomon	787,053
Stove, C. Schweizer	787,310
Stove and ash-sifter, combined, S. Maas	786,825
Stove door and name plate, E. W. Anthony	786,793
Stove, gas cooking, M. Ehrsam	787,159
Stove, heating, A. J. Koontz	786,821
Stove steam cooking and water heating attachment, J. P. Hutchison	786,815
Stove, vapor burrning, R. C. Barrie	786,944
Stoves or furnaces, air feeding device for, T. A. & W. G. Twyman	787,014
Stovepipe fastener, R. H. & W. C. Hodge	786,900
Strap fastener, W. D. Lambert	787,335
Swinging gate, A. Tarris	787,315
Switch lock, electric, C. L. Buschmann	787,147
Table. See Cigar-rolling table.	
Tag, F. Bachmann	786,943
Talking-machine, J. E. Beatty	787,264
Tank cleaner, J. W. Bivins	787,266
Tar dehydrater, E. A. Moore	786,828
Tea leaves or the like, apparatus for breaking and grading made, H. M. Alleyn	787,066
Telegraph transmitter, wireless, H. Shoemaker	787,057
Telephone bracket, desk, T. Q. Scott	787,119
Telephone exchange system, J. C. Hubinger	786,901
Telephone exchange system apparatus, J. G. Roberts	787,113
Telephone exchange trunk line, Scribner & McBerty	787,120
Telephone receivers, jointed adjustable support for, E. D. McLean	787,307
Tendon pulling machine, G. A. Congdon	787,025
Thread cutter and tier, J. B. Underwood	787,238
Threshing machine grain weighing device, L. M. Thomson	787,009

Rambler

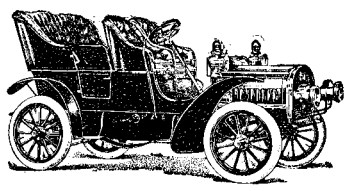
SURREY TYPE ONE

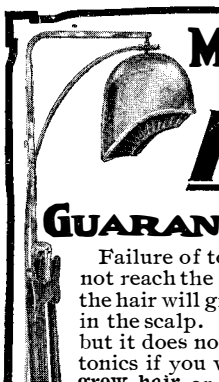
18 horse power, $1350

Its operation is both simple and natural. The ignition is automatic. The brakes are operated by pedals, not by levers. With the steering wheel and throttle, attached to it, operable by one hand, the other is always free to manage the clutches by the single lever, and no confusion is possible. ¶ Full information on request. ¶ Other models $750, $850, $2000 and $3000. *Immediate delivery.*

Main Office and Factory, Kenosha, Wisconsin. Branches, Boston, Chicago, Philadelphia. New York Agency, 134 West Thirty-eighth Street. Representatives in all leading cities.

THOMAS B. JEFFERY & COMPANY





MILLIONS WASTED ON HAIR TONICS

There is But One

HAIR GROWER

GUARANTEE BACKED BY THE BANKS

Failure of tonics to grow hair is due to the fact that such treatment does not reach the seat of the trouble. The hair roots must be nourished before the hair will grow and this can be accomplished only by the presence of blood in the scalp. A vigorous rubbing of the scalp produces a pleasant sensation but it does not open up the veins which supply food to the follicles. Use tonics if you want to soften the hair and make it glossy, but if you want to grow hair or keep it from falling out you must cultivate the roots. Hair falls out for the same reason that a plant dies—lack of nourishment—therefore to preserve it, you need only supply nourishment to the hair roots. This can be done only by the Evans Vacuum Cap.

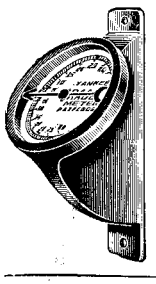
Our Guarantee

We will send you by prepaid express an Evans Vacuum Cap to use thirty days, and all we ask of you is to deposit the price of the appliance in any bank in St. Louis during the trial period, subject to your own order. If you do not cultivate a sufficient growth of hair within this time to convince you that this method is effective, simply notify the bank and they will return your deposit. The effect of the Vacuum is pleasant and exhilarating. It gives the scalp vigorous exercise without rubbing and induces a free and active circulation without the use of drugs and lotions.

Illustrated book free on request

EVANS VACUUM CAP CO. 425 Fullerton Building, St. Louis

EVERYTHING FOR THE AUTOMOBILE



YANKEE GRADE-METER

Price $7.50

Gives the grade accurately up to 40 per cent. up and down. Easily read from the seat.

Yankee Mica Spark Plug

Closed End, $1.50

Open End, 1.00

Both guaranteed 90 days

Mammoth Catalog for 10c. in stamps

E. J. WILLIS CO., 2 Park Place, N. Y.

The R. & C. Magnetic Liquid Indicator

SHOWS AT A GLANCE

the amount of **LIQUID** in a tank. For Motor Car tanks, Motor Boat tanks, Storage tanks, etc. Gasoline, Oil or Water. Operated under **PRESSURE**—or gravity feed. Absolutely reliable and guaranteed.

(an be applied to the Filler Opening of Motor Car tanks in place of ordinary Cap, or separate. For Motor Car tanks, or any tank up to 16 in. in DEPTH.

Price, **$5.00**

Write for full description and illustrations.

Manufactured exclusively by the

R. & C. INDICATOR CO., Inc.

BRIDGEPORT CONN., U. S. A.

U. S. A. LIQUID PISTOL

Nickl-plated 5 ins. long Pat'd

Will stop the most vicious dog (or man) without permanent injury. Perfectly safe to carry without danger of leakage. Fires and recharges by pulling the trigger. Loads from any liquid. No cartridges required. Over **10** shots in one loading. All dealers, or by mail, **50c.** Rubber-covered holster **5c.** extra.

PARKER, STEARNS & SUTTON, 226 South St., NewYork

DO YOU USE GRINDSTONES?

If so we can supply you. All sizes **mounted** and **unmounted**, always kept in stock. Remember, we make a specialty of selecting stones for all special purposes. *Send for catalogue "I"*

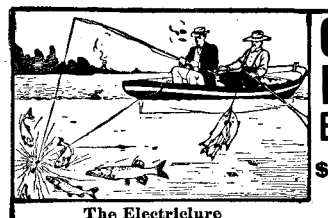
The CLEVELAND STONE CO.

2d Floor, Wilshire, Cleveland, O.

WELL DRILLING Machines

Over 70 sizes and styles, for drilling either deep or shallow wells in any kind of soil or rock. Mounted on wheels or on sills. With engines or horse powers. Strong, simple and durable. Any mechanic can operate them easily. Send for catalog.

WILLIAMS BROS., Ithaca, N. Y.



Catch Fish by Electricity

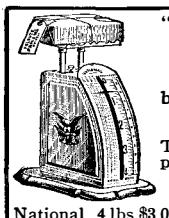
$1.00 complete OUTFIT

The Electriclure

Any kind of fish may be caught by this new method at will. No State in the Union has passed any law against this practice; it's sure every time and great sport, without danger to operator (it fools the big fish). The original sample cost us $1,000. Only a limited number of these outfits can be made this year, so order early. Outfit all complete only **$1.00** with full instructions. Can be carried in the fisherman's ordinary tackle box. By express prepaid, 20 cents extra. Dealers and agents make big money selling these. Send for catalogue of fishing tackle, etc.

The VIM CO., Dept. 19, 68 E. Lake St., Chicago, Ill.

ELECTRIC SEWING MACHINE MOtor.—The instructions and numerous illustrations of details contained in this article will enable any mechanic of average ability to build an efficient motor that will operate a sewing machine. The cost of materials for this machine should not exceed five dollars. See SCIENTIFIC AMERICAN SUPPLEMENT, No. **1210.** Price 10 cents by mail, from this office and from all newsdealers.



"HIGHEST AWARD"

Don't forget to ask for a **PELOUZE POSTAL SCALE**

It means you will get the best postal scale money can buy. Received highest award at World's Fair.

They give instantly exact cost of postage in cts. on all mail matter Warranted.

"Save time and stamps."

For sale everywhere by leading dealers.

Catalog. P.

National	4 lbs.	$3.00
Union	2½ lbs.	2.50
Columbian	2 lbs.	2.00
Star	1 lb.	1.50
Crescent	1 lb.	1.00

PELOUZE SCALE & MFG. CO. CHICAGO.

Automobile Tires

All new and first class, contracted for before the raise in price, and you are offered the benefit.

28 x 2½ inch single tube,	-		$12.50
28 x 3 " " "	-		16.50
30 x 3 " " "	-		20.00

Every accessory and part for an automobile builder or user equally low. You miss it if you don't get our large FREE Catalogue.

J. H. NEUSTADT CO., St. Louis, Mo.

ARTESIAN

Wells, Oil and Gas Wells drilled by contract to any depth from 50 to 3000 feet. We also manufacture and furnish everything required to drill and complete same. Portable Horse Power and Mounted Steam Drilling Machines for 100 to 1200 feet. Write us stating exactly what is required and send for illustrated catalogue. Address

PIERCE WELL ENGINEERING AND SUPPLY Co. 136 LIBERTY STREET, NEW YORK, U. S. A.

SPECIAL ANNOUNCEMENT

To be published on July 1, 1905: A NEW PUBLICATION

entitled

American Homes and Gardens

(Successor to SCIENTIFIC AMERICAN BUILDING MONTHLY)

THIS new monthly magazine will be much broader in scope than its predecessor. It will have the word "HOME" for its keynote. The man to whom this word has no meaning will have no interest in this new publication. It is the intention of the Editor to take the reader with him to various parts of the country and show him how the better class of people live, whether the house may have cost $3,000 or $300,000. Good taste is, perhaps, more necessary in the building and furnishing of a house of small cost than in a mansion of importance.

The Editor will not leave you on the outer doorstep, however, but will take you within, where you may see how the house is furnished and decorated and how the owners live. Then you may have a walk through the garden, and then to the summer house, where, perhaps, the plan of the formal garden culminates.

There will be published articles on room decoration and furnishing, showing how the furniture may be arranged to produce the best effects, what pictures may be hung, and what bric-a-brac, inherited from some former mansion, may with advantage be discarded. In short, the new publication is intended to be

OF INTEREST

To the one who has a Home.
To the one who has not a Home, but who intends to have one.
To the one who wishes to improve the Home and make it more attractive.
To the one who appreciates that the Garden and the House should form part of an harmonious scheme.

Each issue will contain an article on some important mansion, showing, if possible, various views of the exterior, the interior, and the garden. Plans are published with most of the residences shown.

The new publication will be issued monthly, and will be somewhat smaller in page size than the "Building Monthly," viz.: 10½ x 14. It will have a handsome colored cover. It will have about 50 pages each issue. Price, 25 cents each issue; $3 a year.

SPECIAL OFFER TO READERS OF THE "SCIENTIFIC AMERICAN"

To any one subscribing before May 1, 1905, the subscription price will be $2.50 for "American Homes and Gardens" for one year from July 1, 1905, to July 1, 1906, and the subscriber will receive free of charge the "Scientific American Building Monthly" for May and June.

To any one subscribing before June 1, 1905, the same terms will be offered, with a free copy of the June issue included.

To any one subscribing after June 1, 1905, the subscription price, without exception, will be $3.00 a year.

Subscribe at once and obtain the most favorable terms.

CONTRACTS FOR ADVERTISING SPACE IN "AMERICAN HOMES AND GARDENS" may now be secured. Write at once to "Scientific American" Advertising Department and secure preferred locations.

MUNN & COMPANY, Publishers, 361 Broadway, New York

FIFTH REVISED EDITION.

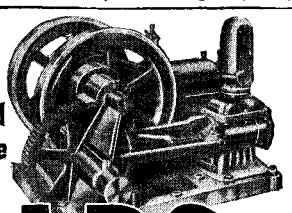
Langbein.—Electro Deposition of Metals

JUST READY.

A Complete Treatise on the Electro-Deposition of Metals: Comprising Electro-Plating and Galvanoplastic Operations, The Deposition of Metals by the Contact and Immersion Processes, The Coloring of Metals, Grinding and Polishing, Voltaic Cells, Dynamo Electric Machines, Thermopiles, The Materials and Processes Used in Every Department of the Art. From the 5th German Edition of George Dr. Langbein. With additions by William T. Brannt. Fifth Edition, in great part rewritten and much enlarged. 170 Engravings, 694 pages. 8vo. *Price $4.00, free of postage to any address in the world.*

An elaborate illustrated circular of this important book, 8 pages, quarto, will be sent to any one furnishing his address.

HENRY CAREY BAIRD & CO.
INDUSTRIAL PUBLISHERS, BOOKSELLERS & IMPORTERS
810 Walnut St., Philadelphia, Pa., U. S. A.

The Wizard Engine  With Pump

OLDS ENGINES

Economical Power

In sending out their last specifications for gasoline engines for West Point, the U. S. War Department required them "to be Olds Engines or equal." This speaks volumes for our engines. It means they excel all others or the U. S. Government would not demand them.

They are the horizontal type, 2 to 100 H. P., and are so simply and perfectly made that it requires no experience to run them, and

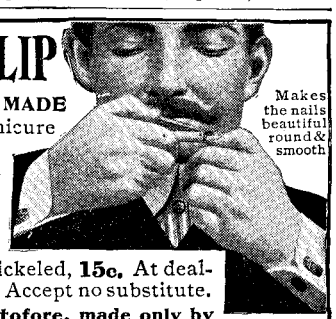
Repairs Practically Cost Nothing.

Send for a catalogue of our Wizard Engine, 2 to 8 H. P. (spark ignition system, same as in the famous Oldsmobile) the most economical small power engine made; fitted with either pump-jack or direct connected pump; or our general catalogue showing all sizes.

Olds Gasoline Engine Works, Lansing, Mich.

New York Agents, R. H. DEVO & Co., Binghamton, N. Y.

KLIP-KLIP



BEST EVER MADE

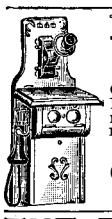
A perfect manicure Quick, easy, simple and strong. The Original, made in German silver, 25c.

Makes the nails beautiful round & smooth

Klip-Klip Jr., nickeled, 15c. At dealers or mailed. Accept no substitute.

As heretofore, made only by

KLIP-KLIP COMPANY,
Send 4c. in stamps for book, "How to Care for the Hands." 556 Clinton Ave. S., Rochester, N. Y.



HIGH GRADE TELEPHONE

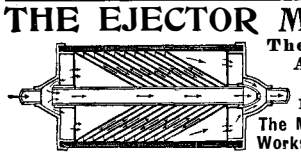
Apparatus and Supplies

Our instruments adapted to Exchange and Long Distance Service. Miners, Lumbermen, Farmers and Factories. Everyone needs Telephone.

Free Instruction Book and Catalogue.

CENTRAL TELEPHONE & ELECTRIC CO.
22d & Lucas Ave., St. Louis, U.S.A.

THE EJECTOR MUFFLER



The Greatest Advance in the Gasoline Age

For particulars, write to

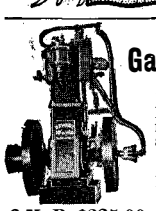
The Motor and Manuf'g Works Co., Ithaca, N.Y.

From Sunrise to Sunset poor paint cracks and crumbles in heat and weather. The paint that endures is

PATTON'S SUN-PROOF PAINT

Lasts for years. We are always glad to advise on any paint question. Book free.

PATTON PAINT COMPANY
227 Lake Street, Milwaukee, Wis.



WEEBER

Gas and Gasoline Engines

For Marine and all power purposes. Workmanship the highest, price per H. P. the lowest. The kind that will run smooth and keep running. Not an experiment but tested out by four years' continuous running. Guaranteed for one year and to give absolute satisfaction. Agents wanted.

3 H.-P $225.00

C. R. WEEBER MFG. WORKS
Albany, N. Y., U. S. A.

50 Years' Experience

PATENTS

Trade Marks, Designs, Copyrights, Etc.

Anyone sending a sketch and description may quickly ascertain our opinion free whether an invention is probably patentable. Communications strictly confidential. Handbook on Patents sent free. Oldest agency for securing patents.

Patents taken through MUNN & Co. receive *Special Notice*, without charge, in the

Scientific American

A handsomely illustrated weekly. Largest circulation of any scientific journal. Terms, $3 a year; four months, $1. Sold by all newsdealers.

MUNN & CO. 361 Broadway, New York
Branch Office 625 F St. Washington, D. C.

Tile, building, A. Pfeiffer	787,215
Tin can, L. Diesel	787,156
Tire, G. H. Hastings	787,173
Tire set, felly, E. N. McComb	786,829
Tire, vehicle wheel, E. A. Scribner	787,311
Tool, P. M. Vance	786,860
Tool, combination, G. E. Hasson	787,172
Tool, hand, S. J. Welter	787,064
Tool handle, pneumatic, J. H. Templin	787,347
Toy, H. T. Turnor	787,062
Toy, B. Palladino	787,109
Trace, short harness, D. K. Bellis	787,265
Trolley catcher and retriever, C. E. Gierding	787,169
Trolley device, A. F. Flierboom	786,887
Trolley stand, B. A. Grasberger....787,033,	787,034
Trolley stand, J. A. Grasberger....787,035,	787,036
Trolley wheel, E. W. Clark	786,795
Trolley wire guide, S. P. McMullen	786,832
Trolley wire replacer, W. Peck	787,343
Trousers press and suit hanger, F. J. Gruhl	786,806
Trunk, Turner & Hyman	787,236
Tube cleaning apparatus, B. S. & C. T. Hughes	787,333
Tube expander, J. M. Brown	787,269
Tubes, forming, L. C. Smith	786,923
Tug, hame, W. L. Stringer	787,229
Turbine, elastic fluid, O. Junggren	787,297
Turbine, steam, J. Stumpf	787,231
Turpentine receptacle, L. D. Byrd	786,950
Type casting and composing machines, intermittent clutch device for, M. Wehrlin	787,138
Type-writing machine, Fay & Hochklassen	786,885
Type-writing machine, E. E. Barney	787,020
Umbrella, G. Turner	787,237
Valve, G. W. Denief	786,960
Valve, A. J. Caldwell	787,076
Valve, emergency brake, F. B. Corey	786,955
Valve, float, J. B. Hawkins	786,895
Valve gear, engine, O. Schwade	787,223
Valve, inflation, J. E. Keller, Jr	787,298
Valve mechanism, engine, J. H. Moore	786,913
Valves, etc., mechanism for operating, H. E. Warren	787,136
Vanner, mineral, H. C. Krause	787,190
Vehicle gear, Wilcox & Hickok	786,867
Vehicle top support, S. M. Buchanan	787,073
Vehicles, power transmission for motor, S. H. Hanson	787,096
Velocipedes, etc., driving and change speed gear for, L. J. B. Savey	787,002
Vending machine, R. D. Work	787,251
Vest protector, R. Spurgin	786,924
Vise, J. F. Emmert	787,328
Voting machine, J. I. Haynes	786,897
Wardrobe, G. W. Warren	787,243
Warp-beam brake, C. E. Buschmann	787,323
Washer. See Packing washer.	
Washing machine gear, J. H. & J. B. Taylor	786,856
Watchmaker's device, W. D. Smith	787,313
Water closet, C. Pfau	787,110
Water heater, S. L. Wottring	787,253
Water heater with garbage burner, M. E. Herbert	787,176
Water motor, W. W. Krewson	787,191
Water pipes, device for automatically reducing pressure in, G. H. Dworzek	787,327
Water tube boiler, H. L. Wilson	787,249
Wave motor, J. Hutchings.....787,181,	787,182
Weather strip, H. E. Kenny	786,972
Weight, J. B. Arthur	787,320
Wheel, J. B. McMullen	787,210
Wheel fender, T. H. Quinn	787,051
Whiffletree coupling, J. R. Pring	787,219
Wind wheel, M. A. & B. H. Sharp	787,346
Winding machine, S. W. Wardwell	786,862
Window, storm, G. E. Harsh	786,893
Wire stretcher, L. Bays	786,945
Wood slicing machine, G. S. Mayhew	787,203
Woodworking machine, N. F. Coffey	787,280
Wrench, A. Johnson	786,818
Wrench, W. J. Sanders	786,844
Writing appliance, J. Jaakson	786,817
Yoke and pole coupling, neck, I. F. Brown	786,870

DESIGNS.

Fabric, textile, W. B. McMechen	37,403
Pocketbook, J. C. Ryerson	37,394
Spoon, fork, or similar article, J. J. Condon	37,392
Spoons, forks, or similar articles, handle for, F. Habensack	37,393
Stove, M. R. Lehman	37,401
Stove, heating, M. R. Lehman	37,402
Stove or range, cooking, F. J. Frey	37,397
Stove, or range, cooking, M. R. Lehman, 37,398 to	37,400
Toy bank, A. C. Williams	37,395
Type, font of, W. Bradley	37,396

LABELS.

"Anti-Fade," for a certain named preparation, J. Schutt, Jr	12,047
"Bleached Muslin," for bleached cotton goods, John S. Brittain Dry Goods Co.	12,038
"Bon Ton," for hose supporters, Carson, Pirie, Scott & Co	12,040
"Boy's Friend," for boots and shoes, M. J. Mullen	12,041
"Colonial Chocolates," for confectionery, Reymer & Brothers	12,044
"Excelsior Record," for talking machine records, International Record Co	12,049
"Fagan's Compound Wine of Tar," for proprietary medicine, T. F. E. Fagan	12,035
"Gold Cream," for evaporated cream, Hires Condensed Milk Co	12,043
"Goose," for cigars, E. Stutz	12,029
"Japanese Rapid Headache Powders," for medicine, Japamer Pharmacal Co	12,033
"Jiu-Jitsu Water—Little Jap' Foot Ease," for medicine, W. M. Brock	12,039
"Little Lady," for brooms, Crites Broom Manufacturing Co.	12,046
"Little Star," for brooms, Crites Broom Manufacturing Co.	12,045
"Mexican Rheumatic Oil," for rheumatic oil, Maar & Johnson	12,037
"Owlarino," for medicine, W. F. Bente	12,034
"Roulette Cards," for playing cards, A. K. Ferris	12,048
"Singley's Hair Strength," for medicine, B. Singley	12,032
"Talpa," for medicine, T. Dyer	12,036
"Tampa Custom House," for cigars, D. A. Switzer	12,028
"U. S. Fancy Patent," for flour, Covington Grocery & Grain Co	12,042
"Union Twist," for cigars, Batastini and Pacella Co.	12,030
"Wendel's Swiss Lozenges," for Swiss Lozenges, H. E. Wendel	12,031

PRINTS.

"Chew and Smoke Mail Pouch," for tobacco, Bloch Brothers Tobacco Co	1,263
"Have You Vitos, Good," for wheat food, Pillsbury-Washburn Flour Mills Co	1,261
"Maverick," for cigars, W. Fechteler	1,264
"Pillsbury's Vitos," for wheat food, Pillsbury-Washburn Flour Mills Co	1,262
"Prince Albert and English Walking Frocks," for clothing, Brokaw Brothers.	1,260
"Swift's Return Tubular Portable Boiler," for boilers, E. H. Swift	1,267
"U. S. Score Pad for the Game of Five Hundred," for score pads, United States Playing Card Co	1,266
"Wine of Cardui," for medicine, Chattanooga Medicine Co.	1,265

A printed copy of the specification and drawing of any patent in the foregoing list, or any patent in print issued since 1863, will be furnished from this office for 10 cents, provided the name and number of the patent desired and the date be given. Address Munn & Co., 361 Broadway, New York.

Canadian patents may now be obtained by the inventors for any of the inventions named in the foregoing list. For terms and further particulars address Munn & Co., 361 Broadway, New York.

WINCHESTER

TAKE-DOWN REPEATING SHOTGUNS

No matter how big the bird; no matter how heavy its plumage or swift its flight, you can bring it to bag with a long, strong, straight shooting Winchester Repeater loaded with Winchester Factory Loaded Shotgun Shells. Results are what count. This combination, which is within reach of everybody's pocket-book, always gives the best results in field, fowl or trap shooting. Winchester guns and Winchester cartridges are made for each other.

FREE Send name and address on a postal card for our large illustrated catalogue.

WINCHESTER REPEATING ARMS COMPANY - NEW HAVEN, CONN.

THE HARRINGTON & KING PERFORATING CO.
PERFORATED METAL OF EVERY DESCRIPTION, FOR ALL USES.
225 NO. UNION ST. CHICAGO, ILL.

SPECIAL MANUFACTURING.
DIES AND STAMPINGS TO ORDER.
SPEC'L MACHINERY-MODELS-EXPERIMENTAL WORK.
DROP FORGING DIES AND DROP FORGINGS.
HARDWARE SPECIALTIES ETC. MANF'D TO ORDER. SEND SAMPLES OR DRAWINGS FOR ESTIMATES. WRITE FOR OUR BOOKLET.
THE GLOBE MACHINE & STAMPING CO.
970 HAMILTON ST., CLEVELAND, OHIO.

ICE MACHINES. Corliss Engines, Brewers' and Bottlers Machinery. THE VILTER MFG. CO., 899 Clinton St., Milwaukee, Wis

MODELS & EXPERIMENTAL WORK. Inventions developed. Special Machinery. E. V. BILLAARD, Fox Bldg., Franklin Square, New York.

Dies, Tools, Models and Special Machinery. Metal Specialties and Stampings Manufactured.
HOEFT & MOORE, Chicago, U. S. A.
OFFICE: 558 FIFTH AVENUE. WORKS: INDIANA & FRANKLIN STREETS.

BALLOONS Aeronaut L. Stevens, Box 181 Madison Sq., N. Y.

PATENT AND WORKING DRAWINGS.
G. M. MAYER, M.E., Monadnock Bl., Chicago, Ill.

Model Machinery and Experimental Work.
W. H. CRAWFORD 194 Broadway, New York City.

THE SCHWERDTLE STAMP CO.
STEEL STAMPS, LETTERS & FIGURES.
BRIDGEPORT, CONN.

Manufacturers of **HARDWARE SPECIALTIES**
Contract Manufacturers and will market articles of merit. LARIMER MFG. CO., 155 S. Jefferson St., Chicago

RUBBER Expert Manufacturers Fine Jobbing Work
PARKER, STEARNS & SUTTON, 228-229 South St., New York

NOVELTIES & PATENTED ARTICLES
MANUFACTURED BY CONTRACT. PUNCHING DIES, SPECIAL MACHINERY.
E. KONIGSLOW STAMPING & TOOL WORKS, CLEVELAND, O.

ORNAMENTS mounted, soldered and finished, in all metals. Souvenir and special work solicited. Gold and silver plating.
J. H. ARTHUR CO., 45 Eddy St., Providence, R. I.

Experimental & Model Work
Cir. & advice free. Wm. Gardam & Son, 45-51 Rose St., NY.

INVENTORS.—Our specialty is practically developing inventions. Design and build special, plain and automatic machinery, presses, dies, models, patterns and jigs. Send for Booklet No. 5.
A. NACKE & SON, 236-42 S. 9th St., Philadelphia, Pa.

INVENTORS We manufacture METAL SPECIALTIES of all kinds, to order; largest equipment; lowest prices. Send sample or model for low estimate and best expert advice. **FREE**
THE EAGLE TOOL CO., Dept. A, Cincinnati, O.

INSTRUMENTS OF PRECISION
HIGH GRADE MACHINERY
Inventions Perfected
P. A. GEIER COMPANY, 50 High St., Cleveland, O.

MASON'S NEW PAT. WHIP HOIST
for Outrigger hoists. Faster than Elevators, and hoists direct from teams. Saves handling at less expense.
Manfd. by VOLNEY W. MASON & CO., Inc.
Providence, R. I., U. S. A.

BUBIER'S POPULAR ELECTRICIAN
Fifty Cents per year. **Electrical Books** for beginners, 10c., 25c., 50c. Sample copy and catalogue FREE.
BUBIER PUB. CO., S. C. - Lynn, Mass.

PROPOSALS FOR FURNITURE FOR BACHELOR QUARTERS, HOTELS, ETC. Office, Isthmian Canal Commission, Washington, D. C., March 29, 1905. Sealed proposals, in triplicate, will be received at the office of the Purchasing Agent, Isthmian Canal Commission, Washington, D. C., until 10.30 A. M., April 28, 1905, at which time they will be opened in public, for furnishing above mentioned furniture. Blanks and full information may be obtained from this office, or offices of Asst. Purchasing Agent, 24 State St., N. Y. City, or Asst. Purchasing Agent, at Custom House, New Orleans, La. H. J. Gallagher, Major, U. S. A., Purchasing Agent.

AUTO STORAGE BATTERIES ALL KINDS
THE WILLARD STORAGE BATTERY CO. CLEVELAND, O

Send for this
Print your own cards, circulars &c. Press $5. Small newspaper press $18. Money saver. Print for others, big profits Typesetting easy, printed rules sent. Write to makers for catalog, presses, type paper, &c. THE PRESS CO., MERIDEN, CONN.

Magical Apparatus.
Grand Book Catalogue. Over 700 engravings. 25c. Parlor Tricks Catalogue, free.
MARTINKA & CO., Mfrs., 493 Sixth Ave., New York.

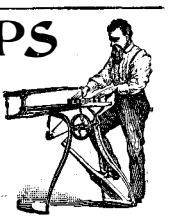
Are you interested in Patents, Model or Experimental work? Our booklet entitled
WHAT WE DO—HOW WE DO IT
will be sent to you on request.
KNICKERBOCKER MACHINE WORKS, Inc.,
8-10-12 Jones Street, New York.

Telegraphy Circular free. Wonderful automatic teacher. 5 styles $2 up. OMNIGRAPH CO., Dept. 52, 39 Cortlandt St., New York.

SLIGHTLY USED FURNITURE
from the INSIDE INN and ten other leading World's Fair hotels
AT ONE-FOURTH COST

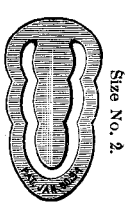
Iron Beds, 50c; Dressers, $2.50; Extension Tables, $3.50; Chairs, 25c; Sheets, 10c; 9x12 Rugs, $5.00; and everything in proportion. All good as new.
Our Big Warehouse is Overflowing Room must be made to handle our contracts. The greatest Bargain Clearing Sale ever held. Complete Catalogue sent FREE. Dept. C. N.
LANGAN & TAYLOR, St. Louis, Mo.

WORK SHOPS



of Wood and Metal Workers, without steam power, equipped with
BARNES' FOOT POWER MACHINERY
allow lower bids on jobs, and give greater profit on the work. Machines sent on trial if desired. *Catalog Free.*
W. F. & JOHN BARNES CO.
Established 1872.
1999 RUBY ST. ROCKFORD, ILL.

THE EUREKA CLIP



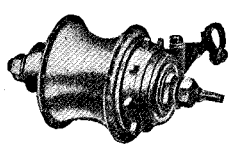
The most useful article ever invented for the purpose. Indispensable to Lawyers, Editors, Students, Bankers, Insurance Companies and business men generally. Book marker and paper clip. Does not mutilate the paper. Can be used repeatedly. In boxes of 100 for 25c. To be had of all booksellers, stationers and notion dealers, or by mail on receipt of price. Sample card, by mail, free. Manufactured by Consolidated Safety Pin Co., Box 121, Bloomfield, N. J.

Size No. 2.

QUALITY ECONOMY

ROCHESTER ELECTRIC MOTOR CO.
10-12 FRANK STREET
ROCHESTER, N. Y., U. S. A.

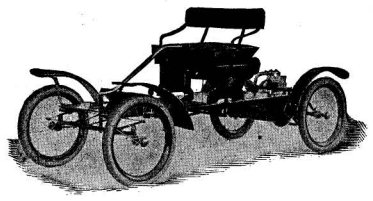
DYNAMOS WRITE US MOTORS



"STANDARD"
Two-Speed Automatic Coaster Brake Hub

Makes wheeling a delight, eliminates the drudgery. Do not waste money on experiments when you can buy a perfect attachment *all in* one hub. Our little booklet tells all about it and is mailed free. Write to-day.

STANDARD SPOKE AND NIPPLE CO. - Torrington, Conn.



Orient Buckboard, 4 H. P. Price $375.

½ CENT A MILE

THAT is all it costs to run an Orient Buckboard at the rate of 35 miles an hour. This is just another point in which the Orient Buckboard distances its competitors in the motor-car field. Ordinary touring-cars use from 2 to 4 cents' worth of gasoline per mile—many of them use a great deal more—and even the lightest cars of other manufacturers cost from 1½ to 3 cents a mile to run.

The Orient Buckboard is the lightest and simplest motor-car on earth. It is speedier than any other car under $1500.

Being a light-weight, the Orient Buckboard saves tire strain and costs less to maintain. This year's model is radically improved over last year's, yet sells for $50 less—only $375. It is the lowest in first cost, lowest in running cost, and lowest in repair cost, of any motor-car made.

Catalogue if you wish.

WALTHAM-ORIENT TOURING CARS

If you are considering the purchase of a big car, you ought to have our simple, practical talk on the choice of an automobile. You ought to have before you the complete details of the Waltham-Orient line for 1905, because the Waltham-Orient Touring Cars (Positive Air-Cooled) are simpler, one fifth lighter, and ten miles an hour faster than water-cooled cars of the same power rating.

Catalogue, showing four styles at $1500, $1650, $2000, and $2250, free if you address

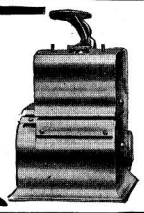
WALTHAM MFG. CO., Waltham, Mass.
Members of Association of Licensed Automobile Manufacturers.

AUTOMOBILES

Do you want to buy a second-hand automobile? Exchange or sell, write us. We are the largest dealers in new and second-hand automobiles in the world. Write us for our bargain sheet of machines on hand. We are sure we have what you want.

TIMES SQUARE AUTOMOBILE COMPANY
164 W. 46th St., near Broadway, **New York City**

Protect Your Checks



Every check you issue is likely to be raised, if unprotected and it falls into unscrupulous hands. Protecticheck sent on trial for ten days to rated parties. Prints indelible figures. Capacity $5 to $5,000. Price $15 if accepted; otherwise return at our expense. Write to-day. Agents wanted

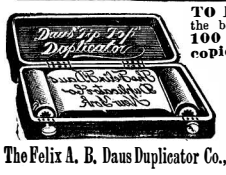
Rochester Metal Mfg. Co.
217 Jay Street Rochester, N. Y.

CHARTER

Stationaries, Portables, Hoisters, Pumpers, Sawing and Boat Outfits, Combined with Dynamos.

Gasoline, Gas, Kerosene.
Send for Catalogue.
State Power Needs.
CHARTER GAS ENGINE CO., Box 148, STERLING, ILL.

What Is Daus' Tip-Top?



TO PROVE that Daus' "Tip-Top" is the best and simplest device for making **100 copies** from pen-written and **50 copies** from typewritten original, we will ship complete duplicator, cap size, **without deposit,** on **ten (10) days' trial.**

Price $7.50 less trade discount of 33⅓ per cent, or $5 Net

The Felix A. B. Daus Duplicator Co., Daus Bldg, 111 John St., New York

Scales All varieties at lowest prices. Best Railroad Track and Wagon or Stock Scales made. Also 1000 useful articles, including Safes, Sewing Machines, Bicycles, Tools, etc. Save Money. Lists Free. CHICAGO SCALE CO., Chicago, Ill.

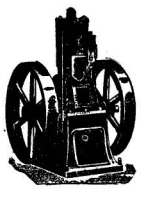
CRUDE ASBESTOS
DIRECT FROM MINES

PREPARED ASBESTOS FIBRE for Manufacturers use

R. H. MARTIN,
OFFICE, ST. PAUL BUILDING
220 B'way, New York.

Cheap Power from Kerosene

SAFE, SIMPLE, VALVELESS AND RELIABLE
Universal Kerosene Engine.



Automatic in operation, easily started, and runs steadily and at a comparatively high rate of speed at a cost of less than one pint of kerosene oil per actual horse power hour. Praised wherever used. Highest efficiency at lowest cost. For prices and terms address

UNIVERSAL KEROSENE ENGINE CO.
6, 8 and 10 First St., New York

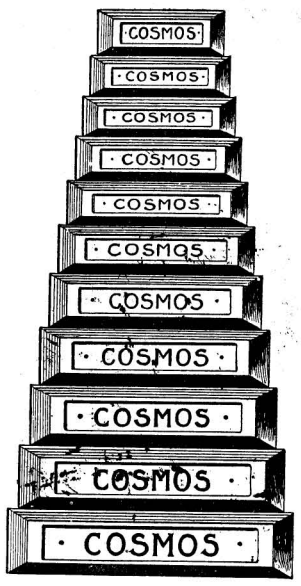
Our Microscopes, Microtomes, Laboratory Glassware, Chemical Apparatus, Chemicals, Photo Lenses and Shutters, Field Glasses, Projection Apparatus, Photo-Micro Cameras are used by the leading Lab-oratories and Gover'nt Dep'ts Round the World

MICRO SCOPES

Catalogs Free

Bausch & Lomb Opt. Co.
ROCHESTER, N. Y.
New York Chicago Boston Frankfurt, G'y

JESSOP'S STEEL THE VERY BEST FOR TOOLS, SAWS ETC.
Wm JESSOP & SONS Ltd 91 JOHN ST. NEW YORK



I Am The Maker of

ROBSON'S COSMOS Anti-Friction METAL

Cosmos is an alloy which has proved an unqualified success I personally superintend the manufacture of every bar. My guarantee goes with each one. There are many good reasons why Robson's "Cosmos" is better than any other anti-friction metal. Read them. I make every claim good.

1.—Oxidizes less; 2.—Wears longer, therefore economical; 3.—Runs cool; 4.—Runs smooth; 5.—Stands harder usage; 6.—Double refined; 7.—Runs freely; 8.—Makes clean castings; 9. Quality never varies; 10.—An honest metal; 11.—Has stood most crucial tests; 12.—Used throughout the United States; 13.—Prompt shipments; 14.—Price is right; 15.—I prepay freight.

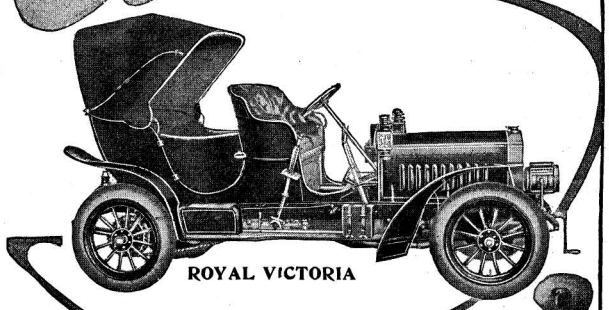
Write for prices at once. You are taking no chances. You will find "Cosmos" positively the best all-around anti-friction bearing metal on the market. A trial is all I ask.

ABSOLUTE GUARANTEE

I guarantee that if Robson's "Cosmos" anti-friction metal is not satisfactory, you may, in thirty days after shipment, return at my expense all unused "Cosmos" and I will refund your money.

LE GRAND O. ROBSON,
1234 Broadway, BUFFALO, N. Y.

Columbia



ROYAL VICTORIA

ELECTRIC VEHICLE COMPANY
HARTFORD, CONN.

NEW YORK 134 W. 39th St. BOSTON 74 Stanhope St. CHICAGO 1413 Michigan Ave.

Member Association Licensed Auto Manufacturers

Uniformity of Excellence in Motive Apparatus Control and Body Appointments that Can be Found in No Other Automobiles.

35-40 H. P. Gasoline Cars

Standard Side Door Entrance	$4000
Royal Victoria	5000
Double Victoria	5000
Landaulet	5500
Limousine	5500

18 H. P. Light Gasolene Touring Car $1,750
Electric Victoria Phaeton $1,350
Light Electric Runabout $900

Catalogue of Columbia 35-40 h.p. and 18 h. p. Gasolene cars will be sent on request; also separate catalogue of Columbia Electric Carriages and Columbia Commercial Vehicles.

Jan 3 2d Military Information Division Chief of Staff 1905 War Dept

Flaud WATCHES

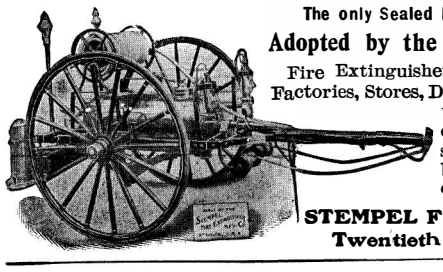
The man who owns or drives an Auto should not use an expensive watch. The New England screw cased watches are perfection for Motor work. Dust and wet proof. Accuracy guaranteed

THE NEW ENGLAND WATCH CO., 37 & 39 Maiden Lane, New York
63 Victoria Street, Liverpool, England

Stempel Marine Fire Extinguishers

The only Sealed Bottle and Quick-Action Extinguisher

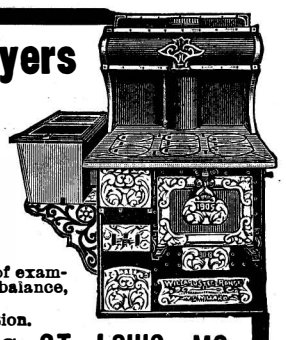
Adopted by the Board of Steamboat Inspectors



Fire Extinguishers and Chemical Engines for Boats, Factories, Stores, Department and Homes. Before equipping let us send our representative to demonstrate their superiority. The sealed charge is essential for use on boats and an advantage for all commercial purposes.

STEMPEL FIRE EXTINGUISHER MFG. CO.
Twentieth and Ferry Sts., St. Louis, Mo.

Range Bargains For Cash Buyers



On account of change of patterns, I will close out over 1,000 shop-worn—not second-hand—

$30.00 STEEL RANGES FOR $15.00

Buy by mail and save 50% on your purchase. Better order now. Everybody knows the "WILLARD" Range. If you haven't one, you are missing a good thing.

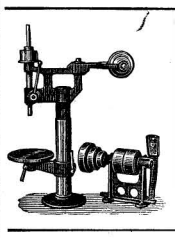
SHIPPING WEIGHT, 400 LBS; top cooking surface, 30x34 ins.; oven, 17x12x21 ins.; 15-gallon reservoir; large warming oven; heavy steel body; asbestos lined; heaving castings; japanned trimming. Repairs at anytime at 3 cents per pound.

Sent C. O. D. to any station in the U. S., with privilege of examination, on receipt of $1.00, as evidence of good faith. Pay the balance, $14.00 and freight, when it arrives.

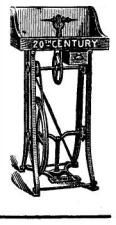
Descriptive circular and testimonials sent upon application.

WM. G. WILLARD, No. 12 Willard Building, (OPPOSITE MERCHANTS EXCHANGE) ST. LOUIS, MO.

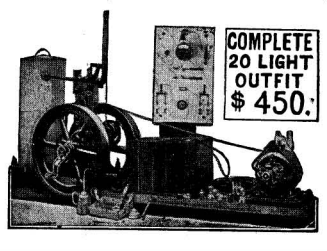
The Modern Machines for Mechanics



Here are two of the most useful and indispensable machines. The cut on the left shows the best Bench Drill ever constructed for sensitive work. Drills from smallest size up to 5-16 inch. Spindle has Morse No. 1 taper hole and is counterbalanced by coil spring around feed lever shaft. Insures perfectly true and accurate work. The Twentieth Century Polishing Lathe, see cut on right, is one of many different styles and sizes of Polishing Lathes that we manufacture. We have them to run by foot or belt power, for use in all mechanic's lines. Send for catalogues B-15, C-15.



THE W. W. OLIVER MFG. CO., 1482 Niagara St., Buffalo, N. Y.



We have complete Outfits for ....

YOUR OWN ELECTRIC LIGHTS

Any size place, summer homes, launches, yachts, etc. Every detail included; very best material: practical. So simple no electrician required. **Light All the Time,** as storage battery included. **Gas, Gasoline** or **Steam** engines used give plenty of power for pumping water, sawing wood, refrigeration, etc. For our new 56-page Catalogue describing over 100 different outfits, address

ELECTRIC DEPARTMENT
RICHARDSON ENGINEERING CO., Hartford, Conn.

$1250 to $1500. Prompt Deliveries
4 Cylinder Air Cooled. Cools Under All Conditions
This letter is one of hundreds of proofs:

"Alliance, Nebraska, to Denver, Colorado, we made a rise of 1,000 feet in 7 miles through sand over rims, using hill climbing gear. When we reached the top we threw in the high gear and she started off at a 30 mile an hour gait."

Write for Catalogue

PREMIER MOTOR MFG. CO., 210 Shelby St., Indianapolis, Ind.

STARRETT TOOLS

are the standard for Accuracy, Design, Workmanship and Finish.

Send for Free Catalogue No. 17B, of up-to-date tools for mechanics.

The L. S. Starrett Co., Athol, Mass., U. S. A

Regular and rational riding in fresh air and sunshine is exhilarating exercise.

POPE BICYCLES

have long been synonyms for quality. The 1905 models are better than ever. Improvements and new features.

PRICES, $22.50 to $100.00

Complete Line of Juveniles.

Columbia Cleveland
Tribune Crawford

POPE MFG. CO., Hartford, Conn.

Rambler Crescent
Monarch Imperial

POPE MFG. CO., Chicago, Ill.
Address Dept. B for Catalogues.

AUTOMOBILES $195

Up (we can sell your auto). Auto and Launch Supplies, Engines, etc. Send postage.
Auto Exchange & Supply Co.
A.L. Dyke, Manager, 3939 Olive, St. Louis

HOROLOGICAL DEPARTMENT
BRADLEY POLYTECHNIC INSTITUTE

Formerly Parsons Horological Institute
PEORIA, ILLINOIS
LARGEST and BEST WATCH SCHOOL in AMERICA

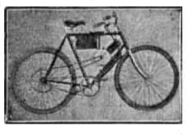
We teach Watch Work, Jewelry, Engraving, Clock Work, Optics. Tuition reasonable. Board and rooms near school at moderate rates.

Send for Catalog of Information.

Convert Your Bicycle into a Motorcycle

at a moderate cost, by attaching the **Mesco 1¾ H. P. Motor Outfit** which includes all accessories to make a complete machine without alteration. Choice of three transmissions. Parts sold separately. Write for catalogue and agency.

MOTOR BICYCLE EQUIPMENT & SUPPLY CO.
Buffalo, N. Y.



Convert your Bicycle into a Motor-Cycle or your Boat into a Launch by using one of the **Steffey Motors.** Also a complete line of Motors and Castings for Auto or Stationary. Lowest prices. Send stamp for catalog

STEFFEY MFG. CO.
2720 Brown St., Phila., Pa.

WARREN'S NATURAL ASPHALT SAND SURFACED ROOFING

Apply it yourself. Makes a finished gravel roof. Comes ready to lay in rolls of 108 square feet. Write for sample, circular and prices. **Warren Chemical and Mfg. Co., 18 Battery Pl., New York**

WE WANT AGENTS

in every town to ride and sell our bicycles. Good pay. Finest guaranteed **1905 MODELS,** with Puncture-Proof tires, Coaster-Brakes **1903 & 1904 Models** of Best Makes..... **$10 to $24**
$7 to $12
500 Second-Hand Wheels All makes & Models good as new **$3 to $8**
CLEARING SALE at half cost.
We *SHIP ON APPROVAL* and **TEN DAYS TRIAL** to anyone *without a cent deposit.* Write at once for **Special Offer** on sample bicycle.
TIRES, SUNDRIES, AUTOMOBILES.
MEAD CYCLE CO., Dept. M 58 CHICAGO

HEIMET OIL LUBRICATES ANYTHING. IF YOU HAVE A HOT BOX TRY IT. C. H. BESLY & CO. CHICAGO, ILL. U.S.A.
15 to 21 Clinton Street.